GARDNER ON GOULD AND DARWIN • ACUPUNCTURE CLAIMS • *SKEPTICS AND TRUE BELIEVERS*

Skeptical Inquirer

THE MAGAZINE FOR SCIENCE AND REASON

Volume 23, No. 4 • **July/August 1999**

Special Issue

SCIENCE & RELIGION

Conflict or Conciliation?

Stephen Jay Gould

Richard Dawkins

Steven Pinker • Ernst Mayr

Steve Allen • Chet Raymo

Paul Kurtz • Eugenie Scott

Kendrick Frazier • Victor J. Stenger

Barry Palevitz and many others

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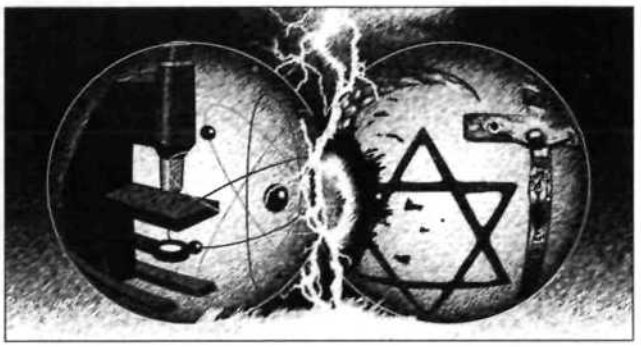

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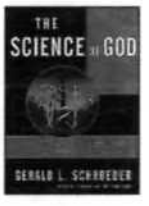

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EDITOR'S NOTE

A Special Issue on Science and Religion

This special, expanded issue of the SKEPTICAL INQUIRER presents ten invited original articles, three book excerpts and one journal article excerpt, three book reviews (plus three "mini-reviews"), two columns, and several miscellaneous short features on a single broad topic: "Science and Religion: Conflict or Conciliation?" It is the first single-subject issue we have ever published.

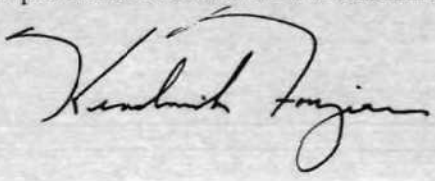
My introductory essay, "Conflicting or Complementary? Some Introductory Thoughts About Boundaries," attempts to place the subject in some preliminary context. I hope you will begin with that and then read astronomer Chet Raymo's poetic and evocative "Celebrating Creation." The other articles then proceed substantively to explore and round out what to me seems a wonderfully diverse set of examinations.

The authors are distinguished scientists, scholars, educators, and writers. All speak from a commitment to science and scientific skepticism, but they offer an impressively wide spectrum of viewpoints. About half are CSICOP Fellows, half have no SI or CSICOP affiliation. There is no "religion bashing" here. There *is* steadfast defense of science. There are attempts to define and observe clear-cut boundaries, and also pleas to observe each others' domains with mutual respect. We strived for thoughtful, informed, forthright considerations of the issues that confront scientists, scholars, teachers, skeptics, religious leaders, and the general public in dealing with often troublesome issues along the borderlands of science and religion.

Why are we doing this? Many reasons. We are both a science magazine and a magazine of ideas. It is true that science restricts itself to explanations that can be inferred from confirmable data. Explanations that cannot be based on empirical evidence are not a part of science.

The SKEPTICAL INQUIRER has generally adopted the same position in regard to what we consider our domain. Specific claims that are amenable to empirical examination are fair game to science-based criticism. Science itself has nothing to say about the others. But our subtitle is "The Magazine of Science and Reason," and reason and philosophical inquiry are also part of our domain. I don't know whether the boundaries between science and religion are any more troubled or awash with controversy than they always have been, but I do know that many scientists and skeptics find these issues both troubling and intriguing. We have had many requests to examine them. I hope and believe that the insights expressed here may help find some common ground for understanding both within the community of scientific skepticism and in working with our friends and neighbors in the wider public.

I expect that these articles will stimulate a variety of fresh discussion of all these issues. We welcome your response. We will publish selected reactions in a future issue. Except for that, we will return to our usual format of diverse examination of the entire gamut of topics and issues of interest to the scientific and skeptical communities.



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Questioning Dr. Isadore Rosenfeld's China Acupuncture Story

GARY POSNER

"What's wrong with this picture?" That familiar refrain came to mind as I was reading the paragraph, in Dr. Isadore Rosenfeld's August 16, 1998, *Parade* magazine article "Acupuncture Goes Mainstream (Almost)" in which he describes an extraordinary Chinese operation witnessed by him in the 1970s. That same question echoed upon my inspection of the accompanying picture—a documentary photograph of that operation, taken by the author himself.

Dr. Rosenfeld, a cardiologist and professor of medicine, has appeared on national TV talk/interview shows since the 1960s. He has written several books, including the 1996 best-selling *Dr. Rosenfeld's Guide to Alternative Medicine.* Upon locating the book, I found a discussion of the operation in question on pages 30–32. My quotations herein are from the *Parade* article, the book, and several e-mail communications to me from Rosenfeld.

Accompanied on his China trip by several other prominent American physicians (now deceased), the Rosenfeld party watched as a 28-year-old female patient was wheeled into an operating room at the University of Shanghai and prepped for heart surgery to repair her mitral valve. But in lieu of standard anesthesia, a practitioner placed "an acupuncture needle in her right earlobe" (per *Parade*), with an electrode attached to supply a mild electrical current.

Rosenfeld observed as "the surgeon . . . cut through the . . . breastbone with an electric buzzsaw [and] her chest was split in two [and] spread apart with a large clamp to expose the heart" (per his book). Rosenfeld shortly thereafter snapped the photograph that appears in *Parade* (it was not used in the book). Because Rosenfeld has denied me permission to reprint his photograph, artist Don Addis has faithfully reproduced its image (figure 1), which is rotated 90 degrees counterclockwise. (Addis, editorial cartoonist for the *St. Petersburg Times*, is also the cartoonist for the *Tampa Bay Skeptics Report.*)

Figure 1. A Chinese woman allegedly undergoing heart surgery without anesthesia.

Don Addis

Figure 2. The apparent area of the incision, far removed from the breastbone.

Only the patient's face and incision are visible through the gaps in the surgical sheets. Assume, as the photo appears to indicate, that her head is essentially "face up" as opposed to being significantly rotated right or left. (Her eyes are focused to her left, as if she is attempting to observe the operation but cannot rotate her head.) Drawing a vertical line down the midline of her body, the operative field appears to be displaced far to the patient's left, rather than being centered where the breastbone and heart are situated. In fact, it appears so far to the left as to exist beyond the border of the patient's body (see figure 2). There does not appear to be any appreciable distortion in the photo such as might be encountered from the use of a wide-angle lens.

Rosenfeld says that this apparent leftward displacement "must be due to the angle at which [the photo] was taken" (per e-mail to me). He informed me that one of the others present (Dr. Wilbur Gould, ENT) had also taken photos and that his widow ". . . no doubt has all his . . . pictures in her possession." But he would not assist me in contacting her to obtain the photographs for review, saying that he did not wish to "participate in your project to prove that my four colleagues and I did not see what we saw."

In addition to the photographic oddities, I asked Rosenfeld how such surgery could have been performed without artificial ventilation: With the chest split open as described, the negative pressure produced by chest-wall expansion could not be created, the lungs would collapse, and the patient would asphyxiate. I pointed out other problems as well, which are explored in a more extensive article on this matter that I have written with Dr. Wallace Sampson, tentatively planned for publication in the Fall/Winter 1999 issue of *The Scientific Review of Alternative Medicine* (*SRAM*).

I suggested to Dr. Rosenfeld that his party may have been taken in by a hoax perpetrated for propaganda purposes—a well-documented tactic used by the Chinese during the Cold War. But

Rosenfeld scoffed at the notion (as he does in his book) and suggested that I contact Dr. Michael DeBakey, one of the world's foremost cardiac surgeons, who "witnessed a similar procedure one year later [and] can explain your legitimate technical questions about ventilatory support. I spoke with him yesterday . . ." (per Rosenfeld's e-mail).

I asked Sampson to speak with DeBakey on our behalf, and the results of that interview were quite enlightening.

DeBakey informed Sampson that despite his conversation with Rosenfeld just a few days earlier, he had neither read Rosenfeld's accounts of the operation nor seen his photograph, and he was thus unconversant with the details in question. As for his own experience in China, DeBakey recalled that the mitral valve surgery that he had witnessed involved a patient who, it turned out, had received not only acupuncture, but also intravenous medication before and during the operation. Additionally, DeBakey told Sampson that artificial ventilation had not been needed in the operation that he saw because it had been performed through an incision between two right ribs, thus sparing one (the left) lung. He added that, in his opinion, a midline, split-breastbone approach, such as described by Rosenfeld, would likely cause both lungs to collapse, just as we had suspected.

Before I knew of Sampson's own interest in this case, and at about the time I was initiating my correspondence with Rosenfeld, Sampson had written to *Parade* editor Larry Smith (Rosenfeld is the magazine's health editor), pointing out some of the incongruities I've noted here. He asked how he might assist *Parade* in rectifying "the incorrect impressions given by the article." Sampson, a professor of medicine at Stanford University and editor in chief of *SRAM*, did not receive a reply.

A few additional observations about the precision of Rosenfeld's recollections and his attention to detail in recounting them: He acknowledged to me that, not being a surgeon, he actually "did not pay any particular attention at the time to the surgical technique used." He says in his book (contrary to the *Parade* version) that "needles" (plural) had been placed in the patient's "left" (not "right") earlobe. He explained to me that this "was a typo, which was not picked up since I did not use the photo" in the book. But the image was presumably indelibly imprinted in his mind. From the book: "I took a color photograph of that memorable scene: the open chest, the smiling patient, and the surgeon's hands holding her heart. I show it to anyone who scoffs at acupuncture." Yet, the photo clearly shows the surgeon's hands to the lower-left of the patient's heart—hardly another "typo."

Toward the end of our correspondence, Rosenfeld told me that, in publicizing the China story, his motivation had simply been "to draw attention to the possible use of acupuncture to alleviate chronic pain and suffering. . . . I thought acupuncture was worth looking into. I still do, as does a panel convened recently by the NIH. . . . I continue to keep an open mind on the subject." While I expressed my appreciation of that position, I also conveyed my concern that many of *Parade*'s 80-plus-million readers could easily have drawn a conclusion that Rosenfeld says he did not intend—that acupuncture appears to possess mysterious and unexplained, perhaps even supernatural, anesthetic properties.

To this point about the important role that authorities such as Rosenfeld play in educating the American public on health-related issues, he replied, "As far as your fear that my readers will opt for acupuncture anesthesia during heart surgery, I think I can reassure you not to worry about it." Oh. Well, never mind, then.

Gary Posner, M.D., an internist and medical software company executive, is a contributing editor to The Scientific Review of Alternative Medicine, *founder of Tampa Bay Skeptics, and a CSICOP scientific consultant.*

Scam Fortune Teller Arrested, Sentenced to Prison for Fraud

On December 9, 1998, U.S. Attorney Donald Stern and Special Agent Barry Mawn of the FBI's Boston Field Office announced that a forty-seven-year-old woman, Kitty Tene, was sentenced to one year and three months in prison on charges of wire fraud and transportation of stolen property. Ms. Tene, who claimed to be a psychic and tarot reader, operated in Boston. In September 1996 a woman approached Tene, who was offering tarot readings for $15 in the back of a restaurant.

The victim believed Tene's tarot readings to be accurate and agreed to subsequent regular meetings with Tene. During the meetings, Tene befriended the victim and learned that she had received a substantial inheritance.

In November 1996, Tene told the victim that her inheritance was the cause of her personal and professional unhappiness. Tene convinced her client that she could cleanse the money of evil spirits and, thereafter, Tene would return the money and the victim's life would get back on the right path.

Tene instructed the victim to make cash withdrawals, which would later be used during "cleansing ceremonies" so that Tene could "rid it of evil." After receiving nearly $160,000 in cash and items valued at more than $40,000, Tene left Boston for New York, never returning to see the victim again.

Tene was finally arrested by the FBI in March 1998. In addition to the prison time, U.S. District Court Judge Nancy Gertner ordered restitution of $202,817 and ordered that Tene serve three years of supervised release upon completion of her sentence.

In another case in New York City, two women were arrested for pulling a similar scam in the borough of Queens. Sonya Cruz (also known as Signorita Rita), 34, and Estee Lee, 43,

were arrested in late January 1999 and charged with scheme to defraud, grand larceny, and fortunetelling. Cruz reportedly hosted a fortunetelling radio show and placed ads in newspapers to attract customers. The women charged customers more than $1,000 to take away supposed curses or heal problems, such as a husband's drinking.

—Benjamin Radford

Ben Radford is Managing Editor of SKEPTICAL INQUIRER.

The Church Poltergeist: It's the Village Mayor

"Just in time for Halloween," was the wry comment of Leon Harris, news anchor for CNN's "Early Edition," October 22, 1998. Harris was responding to spooky events reported in a church in Delain, France, a village of 200 inhabitants in the foothills of the Alps.

According to news sources, fifty people had witnessed poltergeist-like phenomena, including toppled statues and candles flying across the nave. The church was soon closed, while an exorcist was called in to drive out the sinister force.

Then came a follow-up from the Associated Press. The November 1 report explained that the village mayor, Thierry Marceaux, 32, had been detained by police after admitting he was responsible for the apparently paranormal events. He had produced all of the effects, lurking in shadows and tossing the objects, then appearing moments later to feign horror.

Local authorities, threatening to charge Marceaux for wasting police time, freed him on condition he see a psychiatrist. He apologized for his mischief—supposedly intended to amuse—through his attorney.

—Joe Nickell

Joe Nickell is Senior Research Fellow at CSICOP.

Fatal Non-vision

Although billing himself "Canada's world renowned super psychic," Maha Yogi A. S. Narayana failed to foresee his own murder.

"Lord Narayana"—actually Austrian-born Alfred Schmielewski—gave readings at psychic fairs where he claimed to be, among other superlatives, "the world's foremost authority in the field of world prophecy." Although he was one of millions who correctly predicted (in 1980) that Ronald Reagan would win the U.S. presidency, he had numerous "misses." For example, the planet's "greatest natural disaster" did not hit Montréal in 1988; neither was Mikhail Gorbachev assassinated in the Kremlin in 1987.

Although the 71-year-old seer also styled himself "the businessman's psychic," his 1980 and 1994 visions of imminent economic crisis were failed prophecies, and at the time of his death he remained a man of modest means.

Lord Narayana was killed on April 11, 1999, when he answered a knock at the door of his Mississauga, Ontario, home and was shot in the head at point-blank range by an unknown assailant.

Police were speculating—but not predicting—that his killer would prove to be a disgruntled client. They said genuine psychic information was welcome.

—Joe Nickell

FBI Enlisted Psychic in TWA 800 Investigation

According to a story in the May 9, 1999, edition of the *Washington Post*, agents from the Federal Bureau of Investigation used a psychic in an attempt to determine the cause of the TWA Flight 800 airplane crash.

The Boeing 747 aircraft exploded mysteriously off the coast of Long Island in 1996, engendering many conspiracy theories.

The psychic, who was not named, attributed the explosion to a bomb near the left wing. That claim corroborated the FBI's initial conviction that the plane was downed in an act of terrorism, despite contrary evidence provided by the Bureau of Alcohol, Tobacco, and Firearms, the National Transportation Safety Bureau, and the CIA.

In the end, the psychic was wrong: an exhaustive investigation showed that the cause was likely a center fuel tank malfunction. The psychic's proclamation may have been used to justify prolonging the FBI's $20 million investigation, thereby wasting taxpayer's money. But perhaps more dangerously, airline passenger safety was compromised when corrective fuel tank recommendations were put on hold pending the outcome of the FBI's investigation.

—Benjamin Radford

Still a Miracle?

Reported just in time to make news on Good Friday, 1999, a claim of an astonishing miracle became the subject of an investigation by the Roman Catholic Archdiocese of New Orleans.

The story actually began earlier when the pastor of Ascension of Our Lord Church attempted to dispose of a discarded communion wafer by dissolving it in holy water as mandated by church policy. Instead, in a few days it had become stringy and fleshlike, seeming to many parishioners to confirm the Catholic doctrine of *transubstantiation*. This holds that the consecrated wafer and wine of holy communion are not merely symbolic, as most Protestants believe, but actually *become* the body and blood of Christ.

Archdiocesan authorities responded with caution, predicting "a scientific, naturalistic explanation" for the phenomenon and commissioning a medical school professor of biochemistry to test samples of the substance.

After a week of analysis the scientists reported that "no human cellular morphology or structure was seen," only "mold or fungus." At least one church member was undaunted. She told reporters, "to me it was a miracle."

—Joe Nickell□

The Religious Views of Stephen Gould and Charles Darwin

Rocks of Ages is the clever title of the latest book by Stephen Jay Gould, Harvard's famous paleontologist and best-selling author. One of the title's two "rocks" is religion. The other is science, typified by the fossil-rich rocks that support the fact of evolution.

Professor Gould strongly opposes the notion that science and religion are irreconcilable, a claim defended in two classic works: *The Conflict Between Religion and Science* (1877) by the American scientist John William Draper, and the two-volume *History of the Warfare of Science and Theology* (1894), by Cornell historian and first president Andrew Dickson White. Both books, which Gould discusses at length, regard science and religion, especially Roman Catholicism, as locked in eternal combat.

Although Gould calls himself an agnostic inclined toward atheism, his book is a passionate plea for tolerance between the two realms. Science and religion, he contends, are examples of a principle he calls NOMA, or Non-Overlapping Magisteria. There is indeed a conflict between the two if religion is taken in the narrow sense of a creed that requires God's miraculous interventions in history, and refuses to accept the overwhelming evidence for evolution. Such superstitions, by entangling the two magisteria, generate mutual enmity. If, however, religion is taken in a broader sense, either as a philosophical theism free of superstitions, or as a secular humanism grounded on ethical norms, then Gould sees no conflict between the two magisteria. Not that they can be unified in a single conceptual scheme, but that they can flourish side by side like two independent nations at peace with one another.

Science, Gould reminds us, is a search for the facts and laws of nature. Religion is a spiritual quest for ultimate meaning and for moral values that science is powerless to provide. To echo Kant and Hume, science tells us what *is*, not what *ought* to be. "To cite the usual clichés," Gould writes, "we get the age of the rocks, and religion retains the rock of ages; we study how the heavens go, and they determine how to go to heaven." There is no mention of John Dewey, but Gould's theme is not far from the essence of Dewey's little book *A Common Faith.*

Gould quotes liberally from the letters of Charles Robert Darwin, who, together with Thomas Henry Huxley, are two of his greatest heroes. These quotations sent me to *The Life and Letters of Charles Darwin* (1887) by his botanist son Francis. One chapter deals entirely with Darwin's slow disenchantment with Christianity, and his eventual decision to call himself an agnostic. The term had been coined by Huxley, known in his day as "Darwin's Bulldog" for his vigorous defense of natural selection, and his unremitting attacks on the crude protestant fundamentalism of England's prime minister William Ewart Gladstone.

As a youth Darwin firmly believed the Bible to be the inspired word of God. His Anglican father wanted him to become a clergyman, and Charles actually spent three years at Cambridge preparing for ordination. Although he gradually lost his faith, he always remained tolerant and respectful of the views of his Christian friends and associates, especially of the devout beliefs of his wife.

Darwin married his cousin Emma Wedgwood, who bore him ten children. They loved each other deeply, but throughout their otherwise happy marriage each agonized over their irreconcilable religious differences. Janet Browne, in her splendid biography *Charles Darwin* (1995), reprints one of Emma's letters to Charles, written before they married, in which she implores him to give up his habit of "believing nothing until it is proved." Darwin called it a "beautiful letter," and wrote on its envelope, "When I am dead, know how many times I have kissed and cried over this."

The death of their daughter Anne intensified Darwin's antipathy toward Christianity, and widened the religious

Martin Gardner's latest book is Visitors from Oz.

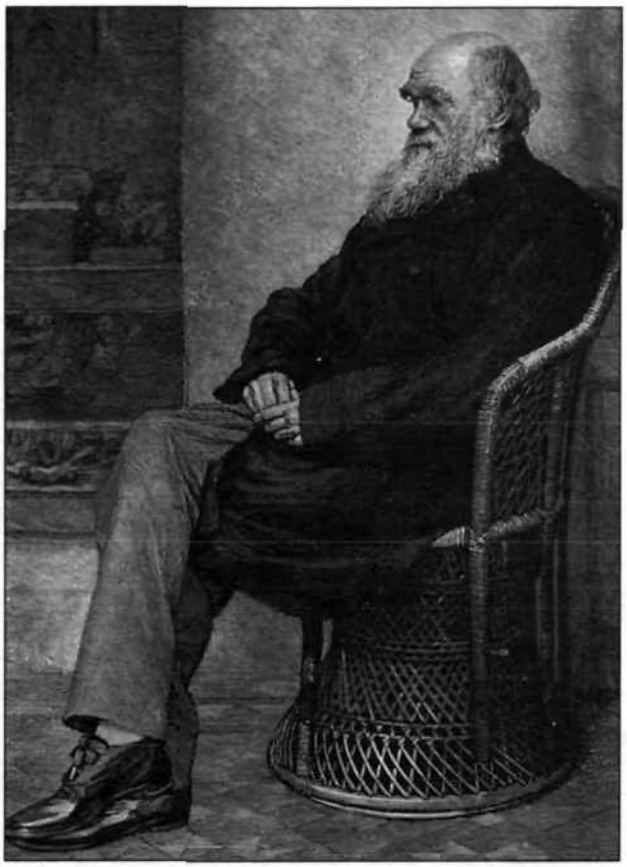
rift between Emma and himself. She never abandoned her faith. As a widow she may have died still tormented (as Browne puts it) by the thought that "she might not meet him [Charles] in heaven." Some biographers have even speculated, though without evidence, that Darwin's chronic illnesses were the psychosomatic consequences of the theological divide between himself and his beloved wife.

Darwin's religious tolerance is at the heart of Gould's book. He even praises Pope John Paul for his 1996 statement that evolution is no longer just a theory, *but a well-established fact that* Catholics should accept provided they insist that immortal souls were infused into the evolved bodies of the first humans. Gould sees this as a major step on the part of Rome's magisterium toward accepting the NOMA principle.

"Nature is amoral," Gould writes, "not immoral. . . . [It] existed for eons before we arrived, didn't know we were coming, and doesn't give a damn about us. . . . Nature betrays no statistical preference for being either warm and fuzzy, or ugly and disgusting. Nature just is—in all her complexity and diversity, in all her sublime indifference to our desires. Therefore we cannot use nature for our moral instruction, or for answering any question within the magisterium of religion."

Although science is powerless to furnish ethical rules or proofs of God, neither is it capable of ruling out the possibility of a deity or the existence of moral imperatives based on a common human nature. Here is how Gould accurately summarizes Darwin's acceptance of NOMA:

> Darwin did not use evolution to promote atheism, or to maintain that no concept of God could ever be squared with the structure of nature. Rather, he argued that nature's factuality, as read within the magisterium of science, could not resolve, or even specify, the existence or character of God, the ultimate meaning of life, the proper foundations of morality, or any other question within the different magisterium of religion. If many Western thinkers had once invoked a blinkered and indefensible concept of divinity to declare the impossibility of evolution, Darwin would not make the same arrogant mistake in the opposite direction, and claim that the fact of evolution implies the nonexistence of God.



Charles Darwin

Let's turn now to how Darwin himself, in carefully chosen words, expressed his religious opinions, with great humility and honesty, in correspondence quoted by his son. Here is a paragraph from a letter of 1860:

> One word more on "designed laws" and "undesigned results." I see a bird which I want for food, take my gun and kill it, I do this *designedly*. An innocent and good man stands under a tree and is killed by a flash of lightning. Do you believe (and I really should like to hear) that God *designedly* killed this man? Many or most persons do believe this; I can't and don't. If you believe so, do you believe that when a swallow snaps up a gnat that God designed that that particular swallow should snap up that particular gnat at that particular instant? I believe that the man and the gnat are in the same predicament. If the death of neither man nor gnat are designed, I see no good reason to believe that their *first* birth or production should be necessarily designed.

In another 1860 letter, written to botanist Asa Gray, Darwin had this to say:

> With respect to the theological view of the question. This is always painful to me. I am bewildered. I had no intention to write atheistically. But I own that I cannot see as *plainly* as others do, and as I should wish to do, evidence of design and beneficence on all sides of us. There seems to me too much misery in the world. I cannot persuade myself that a beneficent and omnipotent God would have designedly created the Ichneumonidae with the express intention of their feeding within the living bodies of Caterpillars, or that a cat should play with mice. Not believing this, I see no necessity in the belief that the eye was expressly designed. On the other hand, I cannot anyhow be contented to view this wonderful universe, and especially the nature of man, and to conclude that everything is the result of brute force. I am inclined to look at everything as resulting from designed laws, with the details, whether good or bad, left to the working out of what we may call chance. Not that this notion *at all* satisfies me. I feel most deeply that the whole subject is too profound for the human intellect. A dog might as well speculate on the mind of Newton. Let each man hope and believe what he can. Certainly I agree with you that my views are not at all necessarily atheistical. The lightning kills a man, whether a good one or bad one, owing to the excessively complex action of natural laws. A child (who may turn out an idiot) is born by the action of even more complex laws, and I can see no reason why a man, or other animal, may not have been aboriginally produced by other laws, and that all these laws may have been expressly designed by an omniscient Creator, who foresaw every future event and consequence. But the more

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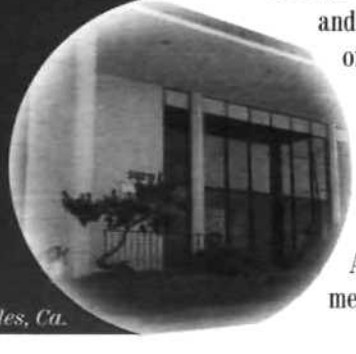

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Co-chairs of the Fund for the Future Campaign: above, author and TV personality Steve Allen; below, author and critic Martin Gardner.

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I think the more bewildered I become; as indeed I probably have shown by this letter.

From a letter of 1873:

What my own views may be is a question of no consequence to any one but myself. But, as you ask, I may state that my judgment often fluctuates. . . . In my most extreme fluctuations I have never been an Atheist in the sense of denying the existence of a God. I think that generally (and more and more as I grow older), but not always, that an Agnostic would be the more correct description of my state of mind.

From a letter of 1879:

It is impossible to answer your question briefly; and I am not sure that I could do so, even if I wrote at some length. But I may say that the impossibility of conceiving that this grand and wondrous universe, with our conscious selves, arose through chance, seems to me the chief argument for the existence of God; but whether this is an argument of real value, I have never been able to decide. I am aware that if we admit a first cause, the mind still craves to know whence it came, and how it arose. Nor can I overlook the difficulty from the immense amount of suffering through the world. I am, also, induced to defer to a certain extent to the judgment of the many able men who have fully believed in God; but here again I see how poor an argument this is. The safest conclusion seems to me that the whole subject is beyond the scope of man's intellect.

In 1876 Darwin wrote a candid autobiography intended to be read only by his wife and children.[1] Francis, in the biography of his father, gives a series of excerpts from this autobiography in which Darwin writes about his religious opinions. I quote this section in its entirety:

Whilst on board the *Beagle* I was quite orthodox, and I remember being heartily laughed at by several of the officers (though themselves orthodox) for quoting the Bible as an unanswerable authority on some point of morality. I suppose it was the novelty of the argument that amused them. But I had gradually come by this time, i.e., 1836 to 1839, to see that the Old Testament was no more to be trusted than the sacred books of the Hindoos. The question then continually rose before my mind and would not be banished—is it credible that if God were now to make a revelation to the Hindoos, he would permit it to be connected with the belief in Vishnu, Siva, etc., as Christianity is connected with the Old Testament? This appeared to me utterly incredible.

"Nature is amoral," Gould writes, "not immoral. . . . [It] existed for eons before we arrived, didn't know we were coming, and doesn't give a damn about us. . . ."

By further reflecting that the clearest evidence would be requisite to make any sane man believe in the miracles by which Christianity is supported,—and that the more we know of the fixed laws of nature the more incredible do miracles become,—that the men at that time were ignorant and credulous to a degree almost incomprehensible by us,—that the Gospels cannot be proved to have been written simultaneously with the events,—that they differ in many important details, far too important, as it seemed to me, to be admitted as the usual inaccuracies of eye-witnesses;—by such reflections as these, which I give not as having the least novelty or value, but as they influenced me, I gradually came to disbelieve in Christianity as a divine revelation. The fact that many false religions have spread over large portions of the earth like wild-fire had some weight with me.

But I was very unwilling to give up my belief; I feel sure of this, for I can well remember often and often inventing day-dreams of old letters between distinguished Romans, and manuscripts being discovered at Pompeii or elsewhere, which confirmed in the most striking manner all that was written in the Gospels. But I found it more and more difficult, with free scope given to my imagination, to invent evidence which would suffice to convince me. Thus disbelief crept over me at a very slow rate, but was at last complete. The rate was so slow that I felt no distress.

Although I did not think much about the existence of a personal God until a considerably later period of my life, I will here give the vague conclusions to which I have been driven. The old argument from design in Nature, as given by Paley, which formerly seemed to me so conclusive, fails, now that the law of natural selection has been discovered. We can no longer argue that, for instance, the beautiful hinge of a bivalve shell must have been made by an intelligent being, like the hinge of a door by man. There seems to be no more design in the variability of organic beings, and in the action of natural selection, than in the course which the wind blows. But I have discussed this subject at the end of my book on the "Variations of Domesticated Animals and Plants," and the argument there given has never, as far as I can see, been answered.

But passing over the endless beautiful adaptations which we everywhere meet with, it may be asked how can the generally beneficent arrangement of the world be accounted for? Some writers indeed are so much impressed with the amount of suffering in the world, that they doubt, if we look to all sentient beings, whether there is more of misery or of happiness; whether the world as a whole is a good or bad one. According to my judgment happiness decidedly prevails, though this would be very difficult to prove. If the truth of this conclusion be granted, it harmonizes well with the effects which we might expect from natural selection. If all the individuals of any species were habitually to suffer to an extreme degree, they would neglect to propagate their kind; but we have no reason to believe that this has ever, or at least often occurred. Some other considerations, moreover, lead to the belief that all sentient beings have been formed so as to enjoy, as a general rule, happiness.

Everyone who believes, as I do, that all the corporeal and mental organs (excepting those which are neither advantageous nor disadvantageous to the possessor) of all beings have been developed through natural selection, or the survival of the fittest, together with use or habit, will admit that these organs have been formed so that their possessors may compete successfully with other beings, and thus increase in number. Now an ani-

mal may be led to pursue that course of action which is most beneficial to the species by suffering, such as pain, hunger, thirst, and fear; or by pleasure, as in eating and drinking, and in *the propagation of the species, etc.; or* by both means combined, as in the search for food. But pain or suffering of any kind, if long continued, causes depression and lessens the power of action, yet is well adapted to make a creature guard itself against any great or sudden evil. Pleasurable sensations, on the other hand, may be long continued without any depressing effect; on the contrary, they stimulate the whole system to increased action. Hence it has come to pass that most or all sentient beings have been developed in such a manner, through natural selection, that pleasurable sensations serve as their habitual guides. We see this in the pleasure from exertion, even occasionally from great *exertion of the body or mind,—in the* pleasure of our daily meals, and especially in the pleasure derived from sociability, and from loving our families. The sum of such pleasures as these, which are habitual or frequently recurrent, give, as I can hardly doubt, to most sentient beings an excess of happiness over misery, although many occasionally suffer much. Such suffering is quite compatible with the belief in Natural Selection, which is not perfect in its action, but tends only to render each species as successful as possible in the battle for life with other species, in wonderfully complex and changing circumstances.

That there is much suffering in the world no one disputes. Some have attempted to explain this with reference to man by imagining that it serves for his moral improvement. But the number of men in the world is as nothing compared with that of all other sentient beings, and they often suffer greatly without any moral improvement. This very old argument from the existence of suffering against the existence of an intelligent First Cause seems to me a strong one; whereas, as just remarked, the presence of much suffering agrees well with the view that all organic beings have been developed through variation and natural selection.

At the present day the most usual argument for the existence of an intelligent God is drawn from the deep inward conviction and feelings which are experienced by most persons.

Formerly I was led by feelings such as those just referred to (although I do not think that the religious sentiment was every strongly developed in me), to the firm conviction of the existence of God, and of the immortality of the *soul. In my Journal I wrote that whilst* standing in the midst of the grandeur of a Brazilian forest, "it is not possible to give an adequate idea of the higher feelings of wonder, admiration, and devotion, which fill and elevate the mind." I well remember my conviction that there is more in man than the mere breath of his body. But now the grandest scenes would not cause any such convictions and feelings to rise in my mind. It may be truly said that I am like a man who has become colour-blind, and the universal belief by men of the existence of redness makes my present loss of perception of not the least value as evidence. This argument would be a valid one if all men of all races had the same inward *conviction of the existence of one* God; but we know that this is very far from being the case. Therefore I cannot see that such inward convictions and feelings are of any weight as evidence of what really exists. The state of mind which grand scenes formerly excited in me, and which was intimately connected with a belief in God, did not essentially differ from that which is often called the sense of sublimity; and however difficult it may be to explain the genesis of this sense, it can hardly be advanced as an argument for the existence of God, any more than the powerful though vague and similar feelings excited by music.

With respect to immortality, nothing shows me [so clearly] how strong and almost instinctive a belief it is, as the consideration of the view now held by most physicists, namely that the sun with all the planets will in time grow too cold for life, unless indeed some great body dashes into the sun, and thus gives it fresh life. Believing as I do that man in the distant future will be a far more perfect creature than he now is, it is an intolerable thought that he and all other sentient beings are doomed to complete annihilation after such long-continued slow progress. To those who fully admit the immortality of the human soul, the destruction of our world will not appear so dreadful.

Another source of conviction in the existence of God, connected with *the reason, and not with the feelings,* impresses me as having much more weight. This follows from the extreme difficulty or rather impossibility of conceiving this immense and wonderful universe, including man with his capacity of looking far backwards and far into futurity, as the result of blind chance or necessity. When thus reflecting I feel compelled to look to a First Cause having an intelligent mind in some degree analogous to that of man; and I deserve to be called a Theist. This conclusion was strong in my mind about the time, as far as I can remember, when I wrote the "Origin of Species"; and it is since that time that it has very gradually, with many fluctuations, become weaker. But then arises the doubt, can the mind of man, which has, as I fully believe, been developed from a mind as low as that possessed by the lowest animals, be trusted when it draws such grand conclusions?

I cannot pretend to throw the least light on such abstruse problems. The mystery of the beginning of all things is insoluble by us; and I for one must be content to remain an Agnostic.

Darwin: "I had no intention to write atheistically. But I own that I cannot see as plainly as others do, and as I should wish to do, evidence of design and beneficence on all sides of us."

When Bertrand Russell was sent to prison for opposing England's entrance into the first World War, the warden asked him what his religion was. Russell replied "agnostic." After asking Russell how to spell it, the warden sighed and said, "Well, there are many religions, but I suppose they all worship the same God." "This remark," Russell adds in his autobiography, "kept me cheerful for about a week."

Note

1. An unexpurgated edition of Darwin's autobiography, edited by his granddaughter Nora *Barlow, was published in 1958 and is currently* available as a Norton paperback. Earlier editions of the autobiography had been heavily censored by Darwin's family, mainly to remove Darwin's biting criticisms of some of his contemporaries. □

INVESTIGATIVE FILES
JOE NICKELL

The Davenport Brothers

Religious Practitioners, Entertainers, or Frauds?

They have become legendary in the history of spiritualism and continue to spark interest and controversy. The question persists: Were the Davenport Brothers "probably the greatest mediums of their kind that the world has ever seen," as Sherlock Holmes's creator Sir Arthur Conan Doyle wrote (1926, 226), or was magician Harry Houdini (1924, 26) correct in reporting that he had facts "more than sufficient to disprove their having, or even claiming, spiritualistic power"? My research into the recently discovered Davenport scrapbook sheds new light on these claims and the fierce disagreement they provoked between Doyle and Houdini.

The Davenports made their debut as mediums in 1854, six years after two schoolgirls, Maggie and Katie Fox, launched modern spiritualism at Hydesville, New York. No doubt the two Buffalo newsboys—thirteen-year-old William Henry Harrison Davenport (b. February 1, 1841) and his fifteen-year-old brother Ira Erastus (b. September 17, 1839)—had heard how the Fox sisters seemed to communicate with ghosts by means of mysterious rapping noises. The boys' father, Ira D. Davenport, was the first to relate the strange happenings. Dishes and cutlery danced about the family's kitchen table and young Ira—when alone—sometimes claimed the spirits had whisked him to distant spots. At household séances, the boys demonstrated their flying ability. As magician John Mulholland explained in his *Beware Familiar Spirits* (1938, 51): "That is, at the beginning of the séance Ira Erastus would be sitting on a chair at one side of the room, and when the lights were turned up after it was over, the chair and boy would be on the other side of the room." This transpired in the dark, so credulous spectators simply assumed the youth had flown.

At the séances, the spirits supposedly also rapped out messages in the by-then-familiar way, but soon advanced to "automatic writing" (Bowers n.d., 155) which was supposedly produced by spirits guiding the entranced subject's hand. Then the brothers' spirit guide "George Brown," found he could speak through Ira when the youth was in a "trance state" (Mulholland 1938, 49–50). Another spirit entity was "John King" who decided the boys should take their spirit demonstrations on the road.

In the halls and theaters rented by their father at the direction of "John King," the Davenport Boys (as they were originally styled) began to give demonstrations of "spiritual manifestations." To show that they were not physically responsible for the phenomena, they were tied to chairs placed behind a curtain. Later the curtain was replaced by a specially designed "spirit cabinet" (Mulholland 1938, 52). This resembled a huge armoire with built-in benches on either side to which the boys were secured by lengths of rope (Jay 1987, 229; Houdini 1924, 21).

On the floor of the cabinet were placed musical instruments such as violins, guitars, concertinas, and tambourines. Then the doors were shut and the lights turned down. Soon, the instruments were heard to play, and phantom hands were seen to wave eerily through small diamond-shaped windows in the cabinet doors. When the gas lights were turned up and the cabinet opened, the Davenport boys were still securely tied. Spectators were divided over the manifestations; some believed, while others scoffed—or worse—and still others were simply mystified (Mulholland 1938, 53–54). In time the boys traveled throughout the United States and, as they matured, called themselves the Davenport Brothers. In 1864 they sailed for England where they "took the literati and public of London by storm" (Dawes 1979, 87) and performed throughout Europe.

On July 1, 1877, while the brothers were on tour in Australia, William Davenport, who had long been in ill health, died. Years later when Harry Houdini (1874–1926) was in Australia he visited William's grave and, finding it in poor condition, had the stone work

Joe Nickell, CSICOP's Senior Research Fellow, is former Resident Magician at the Houdini Magical Hall of Fame in Niagara Falls, Canada.

repaired and flowers planted. Houdini subsequently visited Ira at his home in Mayville, New York, where Ira shared with him a lifetime of secrets (Houdini 1924, 17–25).

Ira spoke to Houdini as one magician to another, even revealing how he and his brother had extricated themselves from their bonds in order to produce the "spirit" effects. Houdini stated, "Ira Davenport positively disclaimed Spiritualistic power in his talk with me, saying repeatedly that he and his brother never claimed to be mediums or pretended their work to be Spiritualistic" (Houdini 1924, 26). Ira did admit that they never confessed the truth to their believing parents in order to spare their feelings. Years after Ira's death (on July 8, 1911), Houdini included a chapter on the Davenports and Ira's revelations in his *A Magician Among the Spirits* (1924, 17–37). Houdini included a facsimile of a letter from Ira claiming in regard to the brothers' performances that "We never in public affirmed our Belief in spiritualism" (28).

Ira Davenport with Houdini, 1910

By this time, Houdini's friendship with Arthur Conan Doyle (1859–1930) was irreparably strained. Houdini had been debunking some of the very mediums Doyle had endorsed, and the latter had written to him: "Our relations are certainly curious and likely to become more so, for as long as you attack what I *know* from experience to be true I have no alternative but to attack you in turn. How long a private friendship can survive such an ordeal I do not know, but at least I did not create the situation." Houdini did not help matters by publishing this and other excerpts from Sir Arthur's letters (Houdini 1924, 164). [See also Massimo Polidoro, "Houdini and Conan Doyle: The Story of a Strange Friendship," SKEPTICAL INQUIRER, March/April 1998.]

Subsequently, in his *The History of Spiritualism* (1926, I: 228), Doyle continued to debate Houdini: "It is to be remarked that the Davenports themselves, as contrasted with their friends and travelling companions, never claimed any preternatural origin for their results." But Doyle noted that Ira's statement to Houdini only said the brothers had never "in public" affirmed belief in spiritualism, implying that *in private* Ira was indeed a spiritualist.

Doyle went on to say that "As Mr. Houdini has seemed to question whether the Davenports themselves ever asserted that they were Spiritualists," the matter was clarified by a letter they had written in 1868 to *The Banner of Light*, the leading American spiritualist journal. Regarding the claim they were not spiritualists, the brothers wrote:

> It is singular that any individual, sceptic or Spiritualist, could believe such statements after fourteen years of the most bitter persecution and violent opposition, culminating in the riots of Liverpool, Huddersfield, and Leeds, where our lives were placed in imminent peril by the fury of brutal mobs, our property destroyed, and where we suffered a loss of seventy-five thousand dollars, and all because *we would not renounce Spiritualism*, and declare ourselves jugglers, when threatened by the mob, and urged to do so. In conclusion, we have only to say that we denounce all such statements as falsehoods. (Quoted in Doyle 1926, II: 302)

Concerning Houdini's claim that Ira Davenport had admitted his results were due to trickery, Doyle (1926, 228–229) said that "Houdini has himself stuffed so many errors of fact into his book . . . and has shown such extraordinary bias on the whole question, that his statement carries no weight. The letter which he produces makes no such admission." Doyle insisted that the Davenports "*were never exposed, nor even* adequately imitated." Again he said, "There can be no question at all, to anyone who has really weighed the facts, that Ira Davenport was a true medium" (Doyle 1930, 23, 45). Astonishingly, Doyle even suggested that Houdini himself might have had mediumistic powers!

That bizarre notion aside, the question remains: Were the Davenport brothers indeed spiritualists rather than mere "jugglers"—a position Doyle advanced (1926, II: 302)? Or is that a false dichotomy, a limited choice between two views with the truth lying elsewhere? A scrapbook that has recently surfaced helps to settle this continuing controversy.

I first saw the scrapbook on one of my visits to *Lily Dale Assembly*, the "World's Largest Center for the Religion of Spiritualism" (as the entrance sign proclaims). I was taking some colleagues on a tour, and in the museum I spied the scrapbook in a display case. It had recently been discovered in a storage area and recognized as a significant find. Later, I was able to study it as part of a three-day stay at Lily Dale, August 7–9, 1998.

It contained several flourished signatures that compare favorably (making allowances for variations over time) with the "Ira E Davenport" signature on the January 19, 1909, letter to Houdini (previously mentioned). There are also apparent signatures of his brother—"Wm Davenport" and "Mr. William Davenport"—although I had no known

specimens for comparison. The scrapbook may have been shared by the brothers, but it appears to have been largely kept by Ira and, after William's death in 1877, became solely Ira's while falling largely into disuse.

Most significantly, the scrapbook contains evidence in favor of both Doyle's and Houdini's views. First, there are several indications that Ira Davenport was indeed an avowed spiritualist. For example, there is the obituary of his infant son and first wife who died in childbirth. Headed "Passed to Spirit Life" (and datelined "Adrian [Michigan], June 29, 1863"), it was very likely written by Ira. It said of his unnamed but "accomplished and beautiful wife": "Possessing a highly refined and cultivated mind and fully realizing the importance of the great truths of Spiritualism, she exercised an elevated influence over her husband in properly directing his energies and mediumistic powers, for the advancement of the facts of immortality." The scrapbook also contains some clippings of sentimental verse, one asking "Is Life Eternal" and answering in the affirmative, another telling a dead lover that "You will be my guardian here."

More evidential are penciled "spirit" writings that appear on some of the early pages. These are scrawled, smeared, overwritten, stained, and otherwise difficult to read. There seems little of interest but one phrase declares, "connected with/with [*sic*] spirit manifesting." The writing may be an early form of Ira's handwriting. It is very likely from the 1850s, at which time Ira was practicing "automatic" writing (Bowers n.d., 155).

In addition, there is a suggestive annotation which Ira signed with his initials. It follows a brief, undated clipping about the Davenport Brothers' impending trial at Centerville, Indiana. The charge was unstated but may have been "showing without a license" which (as demonstrated by another clipping) they were charged with at Ionia, Michigan, in September 1860. To the Indiana journalist's sarcastic comment, "the spirits will help them out of their difficulties, of course," Ira responded by writing, "And they did. I.E.D." The comment is ambiguous. Taken literally it suggests Ira believed he received spirit aid. Or he might have meant that spirits became a mitigating religious issue, which actually happened at Ionia; there spiritualists testified "that the demonstrations given by the Davenport boys were some of the methods which Spiritualists use for disseminating their religious belief."

The Ionia trial provides still additional evidence that bears on Ira's relationship to spiritualism. The brothers had given what one journalist disparaged as "an exhibition of their skill in hemp handling" (i.e., rope tricks) on each of eight successive evenings at a spiritualist assemblage held at nearby Lyons. The article mentioned that "the Spiritualists which number many of our most substantial citizens, felt much aggrieved because of the prosecution." The Davenport Brothers' participation in the "Lyons Spiritual Convention" suggests they were—or were pretending to be—practicing spiritualists.

A clipping from the *Brighton Herald* of December 17, 1864, confirms what is known from other sources, that the Davenport Brothers were accompanied during the early part of their overseas tour by the Reverend J. B. Ferguson, a Presbyterian who became an ardent and eloquent proponent of spirit manifestations and who served as a lecturer with the Davenports' show. By all accounts he had a "minister's simple faith" in the genuineness of the brothers' mediumship (Mulholland 1938, 56, 62). Doyle's insistence that the Davenports were actually spiritualists was based in part on Ferguson. Doyle stated that if Ira claimed otherwise then he was "not only a liar, but a blasphemer as he went around with Mr. Ferguson, a clergyman, and mixed it all up with religion" (Quoted in Houdini 1924, 148).

Even the fact that the scrapbook was discovered at Lily Dale, where it had obviously been for many years, is highly suggestive of Ira's ties to spiritualism. In fact, at an 1885 spiritualist "Camp Meeting" there, Ira Davenport was one of two featured "physical mediums" (those who produced physical phenomena). In reporting on the event, *The Banner of Light* (August 29, 1885) stated that Ira's "fame in this phase of mediumship is world wide."

All of this evidence from the scrapbook indicates Ira Davenport identified himself as a spiritualist as Doyle insisted. (So did Ira's obituary in the July 9, 1911, *New York Times*, which specifically referred to him as a "spiritualist." And his tombstone has a religious, compatibly spiritualistic, message, depicting a rising sun with the words, "There never was night that had no morn.")

On the other hand, it is Houdini whom the scrapbook vindicates regarding the Davenport Brothers' demonstrations. In clipping after clipping there is evidence that supports his claim that—as he said Ira admitted to him—the brothers secretly performed the "spirit" effects by slipping free of their bonds. For example, according to an unidentified clipping, circa 1857–1858:

> [A] printer of this city visited the boys and taking along a little printer's ink, after seeing that the boys were firmly tied, placed it on the neck of the violin. He placed quite a quantity there, and the result was that soon the spirit "John" ["John King"], called through the old tin trumpet for a light, as he had been daubing the boys all over with *paint*! When the light was brought it was found that one of the boys, sure enough, had his shoulder pretty well besmeared. Of course the manager stoutly contended that it was *placed there by the spirit, but our* printer friend was of the opinion that "John" was rather an ignorant spirit if he did not know *printers ink* from paint!

The newspaper continued, saying of the Davenports' performance, "The whole thing is a trick; but it is a clever one. . . ."

A similar exposé occurred in Indiana in 1863 as reported in the May 22 issue of the *Richmond Palladium* in an article titled, "The Celebrated Davenport Boys Brought to Grief." A Dr. Henry Davis "applied oil of kreosote to the handle of the [violin] bow, and as soon as the musical part of the manifestations was over, the hands of the 'mediums' were examined and the odor of the oil was found quite perceptible on the right

hand" of one of the brothers. It was therefore he, said the paper, "who had been making the 'spirit music' with which the audience had been edified," and the brothers were thus "convicted . . . of that part of the swindle." They refused to be tested further, whereupon "a crowd of one or two hundred persons rushed upon the stage" and demanded a refund from the Davenports. "Their box, horns, violins, banjoes, etc., were pretty roughly kicked about the stage." When patrons were promised a refund from the ticket office but found it closed, "A large crowd now assembled in the street and demanded to know the whereabouts of the swindlers. . . ." Peace was only restored by an appeal to law and order. The brothers and their two associates were arrested and charged with "obtaining money under false pretenses." After posting bond, "the swindlers," said the paper, were "turned loose to prosecute still further their nefarious thieving operations. . . ."

Another clipping reported that at the previously mentioned trial at Ionia, Michigan, in 1860, a committeeman had been placed with the brothers in the spirit cabinet. He testified that, in the dark, "he secured between his knees one of the instruments the spirits were said to play on, and . . . after jerking it several times and finding it fast, one of them [the brothers] said in a low voice, 'don't hold it so fast.'" As well, "several witnesses testified to what appeared to them signs of humbuggery" which were "such that darkness was required to do them in. . . ."

Two clippings (one from the *Detroit Free Press,* the other from the Clearwater, Michigan, *Democratic Union*) describe a revealing exposé of November 1860. On a Sunday afternoon the brothers gave one of their exhibitions where, as usual, "permission was given for any person who wished to do so to examine the 'boys' and satisfy themselves that there was no deception about the matter." Thereupon (continued the *Free Press*), "One or two persons took advantage of the permission given, and commencing the search, discovered some of their implements of trade concealed in the boot of one of the performers."

The brothers announced that no further searching would be permitted but, when the searchers persisted, "a general *melee* ensued, during which one of the Davenports drew a bowie-knife or dirk and threatened to kill any person who should lay hands on him." This ended the exhibition and resulted in charges being placed against the brothers. "The one arrested for assault," reported the *Democratic Union, was subsequently* acquitted, after which "the whole were tried" for "exhibiting on the Sabbath" and convicted. Rather than pay a $25 fine each, they elected to serve a 30-day jail term.

Still another scrapbook clipping (unidentified but dated March 24, 1865) tells how two aggressive English skeptics, a Mr. Hulley and Mr. Cummins, "took an active part . . . in baffling the spiritualistic pretensions of the Brothers." Details are not given (although in similar instances reported elsewhere [McHargue 1972, 131–3] the Davenports were stymied when they were tied especially securely). As a result, several persons sought to recover their five-shilling admission fee on the grounds that the brothers failed to perform what their sponsors had promised in their advertisements.

Taken as a whole, the evidence of the scrapbook does indicate that Ira Davenport was a practicing spiritualist, or at least pretended to be, although he and his brother used trickery to accomplish the effects they attributed to spirits. Clearly they were career deceivers who (according to Ira's obituary) "made a fortune of *$600,000*" before William's untimely death and Ira's subsequent retirement. In his old age, Ira's qualms about their dishonesty probably prompted him to make some atonement by confessing the brothers' secrets to Houdini while, at the same time, trying to present their actions in the most favorable light.

Acknowledgments

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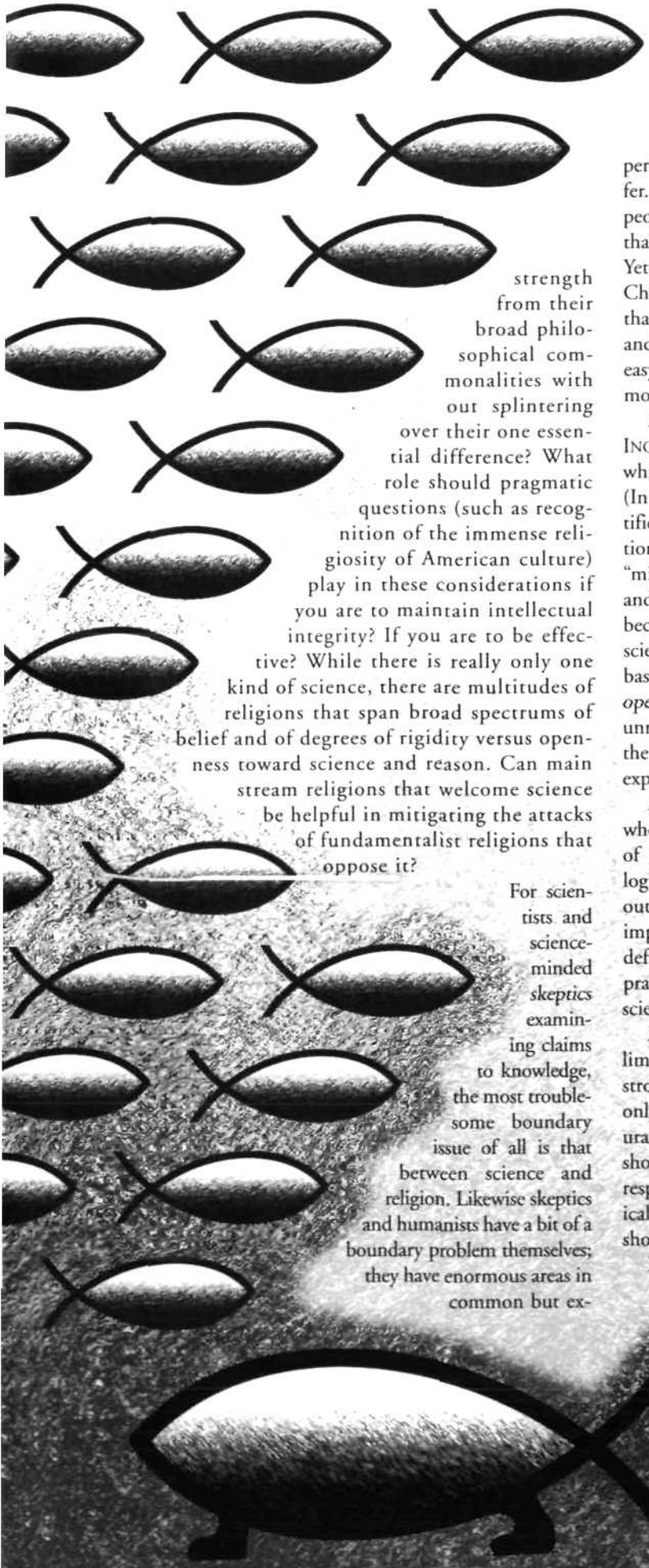
Science and Religion: Conflicting or Complementary?

Some Introductory Thoughts About Boundaries

KENDRICK FRAZIER

Science and religion are two great manifestations of human culture. To what degree are they complementary and to what degree are they in opposition? Does recognition of their separate dominions require mutual distrust or is there room for consilience that does injustice to neither? How can the great issues that separate them best be handled? What about the slightly differing approaches to these issues by what might be termed science-minded skeptics (to simplify, rationalists motivated mainly by an appreciation of science and reason whatever their views about religion) and humanists (rationalists motivated by those same qualities plus a resistance to the idea of a god)? Do they likewise have grounds for mutual agreement that can take



strength from their broad philosophical commonalities without splintering over their one essential difference? What role should pragmatic questions (such as recognition of the immense religiosity of American culture) play in these considerations if you are to maintain intellectual integrity? If you are to be effective? While there is really only one kind of science, there are multitudes of religions that span broad spectrums of belief and of degrees of rigidity versus openness toward science and reason. Can mainstream religions that welcome science be helpful in mitigating the attacks of fundamentalist religions that oppose it?

For scientists and science-minded *skeptics* examining claims to knowledge, the most troublesome boundary issue of all is that between science and religion. Likewise skeptics and humanists have a bit of a boundary problem themselves; they have enormous areas in common but experience some unease over this one interface where they differ. Some data: Polls show that 90 percent of the American people describe themselves as religious. This is much higher than in many of the other countries of the Western world. Yet, perhaps surprisingly, of Americans in the twelve largest Christian denominations, 89.6 percent belong to churches that support evolution education—a subject where science and religion are often perceived to be in disagreement.[1] It is easy to stereotype religious belief, but the situation is far more complex and multilayered than is usually portrayed.

As a journal of science and reason, the SKEPTICAL INQUIRER has generally limited itself to those questions in which some kind of testable, empirical claim has been made. (In the areas of religion, this includes the claims of "scientific" creationism and its attacks on evolution, factual assertions about the Shroud of Turin, testable claims of modern "miracles" such as weeping icons, "Bible code" predictions, and the like.) This has served us well. It is appropriate because science itself is concerned with empirical questions; science formulates explanations of the natural world on the basis of natural, rather than supernatural, causes. All science *operates with the view that supernatural causes are both* unnecessary and unfruitful in formulating hypotheses about the natural world. The SKEPTICAL INQUIRER reflects and expresses that scientific viewpoint.

Assertions about ultimate causes and questions, such as whether there's a God or an afterlife, are of interest to much of humanity and appropriate for philosophical and theological consideration. But they are generally considered to be outside the scope of science. It isn't that such questions aren't important; it is that science, most properly and typically defined, has no ability to resolve them. Science most of all is pragmatic; unfalsifiable questions offer no hope of yielding scientific answers.

Many scientists and skeptical inquirers dispute this more limited interpretation and wish to push science more strongly into criticism of the realms of belief. They hold not only that the laws of nature are sufficient to explain the natural world but that the supernatural does not exist and we should be forthright about that. This view has a long and respected tradition within philosophy, but it is a philosophical one rather than a scientific one, and that distinction should be recognized.

In addition to strictly scientific questions, however, the SKEPTICAL INQUIRER has always considered the wider philosophical, psychological, social, and educational implications of beliefs of all kinds. This is the case whether they are based in logic and reason,

the "paranormal," mysticism, pseudoscience, fringe-science, or religion. Our essential interest is in the advancement and understanding of science, in the use of reason and rationality, in free intellectual inquiry and dispassionate examination of claims to knowledge, and in deeply understanding all important social beliefs and trends. We have no interest in ideology or in proselytizing—only in promoting the use of the diverse methods of science and in applying high standards of scientific inquiry, evidence, reason, and logic.

In this sense some questions and issues along the borders of science and religion are appropriate for our consideration. But it is a fine line that needs to be walked carefully, and we have always tried to do so. With 90 percent of the population in the US self-described as religious (compared with about 50 percent who in surveys express belief in some aspects of the paranormal), this broadly religious social milieu must be recognized as a reality. If arguments based on science and reason are to be heard sympathetically by the wider public you wish to influence, they should be presented with sensitivity toward those who may hold beliefs other than your own. This is merely a matter of respect, sticking to facts rather than opinions, and avoiding any appearance of arrogance or superiority. It is counterproductive to act in any other way. Second, while science deals with facts, evidence, and hypotheses rather than belief, a person's right to hold his or her own beliefs—contrary to your own or even contrary to scientific evidence—must be acknowledged. At the same time any efforts to force those personal beliefs on others, bring them into the science classroom in any guise, or pretend that one's religious beliefs are supported by science must be firmly resisted.

Science is concerned with understanding the natural world, religion with humanity's moral, ethical, and spiritual needs. Were it such a neat division! If science and religion kept to these separate domains, there would be no conflict. However, overlaps or intrusions of one realm into the other are common and inevitable. New scientific discoveries and technological advances both affect our lives in many ways, both good and bad, and continually raise new issues of ethics and human values. Some commingling of science and religion is even encouraged by well-meaning people who find deep value in both and understandably seek to bring them into some kind of unification. They desire to have no compartmentalized aspects of personal philosophy.[2] They rightly point out that science and religion both address deep questions about the world and our place in it. Both arise in part from curiosity and awe about the world. So to some degree consilience may be possible, but only by clearly recognizing the great differences between science and religion.

Science (and reason) must not yield any of its own ground. Science is based foremost on evidence, not authority or revelation. In science, nothing is taken on faith, while in religion, faith is at the heart of belief. In science all knowledge is tentative, continually subject to revision when better explanations and evidence (always aggressively sought) are acquired; religion asserts the presence of unchanging and unchallengeable eternal truths. Science proposes explanations about the natural world and then puts those hypotheses to repeated tests using experiments, observations, and a creative and diverse array of other methods and strategies. Many religions discourage skepticism or critical examination of cherished precepts. This commitment to test the validity of ideas and claims separates science from religion.

Science (and reason) must not yield any of its own ground. Science is based foremost on evidence, not authority or revelation. In science, nothing is taken on faith, while in religion, faith is at the heart of belief.

With these preliminary thoughts in mind, we present this special issue of the SKEPTICAL INQUIRER. It explores these issues in greater detail and from a variety of viewpoints. Do not expect consensus. Not at all. Despite all that they may seemingly have in common—such as their commitment to science and to skepticism—our authors, like our readers, are a diverse lot. Their views on these issues range widely. This is one area where skeptics themselves definitely differ with each other. Resolution is elusive. Yet open airing of viewpoints may serve constructive purposes. That is the hope.

We are interested in your reactions to these articles and in your own observations. We will devote space to them in a future issue.

Notes

1. Some additional information: A 1998 readership poll of a sample of SKEPTICAL INQUIRER subscribers showed that of 799 respondents, 75 percent thought that SI should deal with "the scientific examination of religious claims" and only 17 percent thought it should not. Of the same number of respondents 77 percent said they did not believe in God, 16 percent said they did, and 6 percent gave no answer. Respondents in all three of these categories agreed by no less than a 2 to 1 margin that the SKEPTICAL INQUIRER should "deal with religious claims." (The high level of unbelief among our readers may be a two-edged sword. It allows a level of disinterest and independence that encourages fresh and independent insights and judgment. But I worry that it may make it difficult for us to understand and relate in an effective way to our fellow citizens in the majority population who we want also to embrace the values of science.)

2. This desire to have no compartmentalization is also true, of course, of humanists, who understandably see their opposition to religion and their criticisms of the paranormal as a singular part of the same personal philosophy. □

Kendrick Frazier is Editor of the SKEPTICAL INQUIRER. His latest books are a new, updated edition of People of Chaco: A Canyon and Its Culture *(W. W. Norton 1999), published in April, and* Encounters with the Paranormal: Science, Knowledge, and Belief *(Prometheus 1998), an edited anthology of 48 authors' SI articles from the 1990s.*

Celebrating Creation

We have left the age of miracles behind, but not, we trust, our sense of wonder. We are pilgrim scientists, perched on the edge of eternity, curious and attentive. A scientific skeptic encounters the numinous in a seventh-century chapel in the west of Ireland.

CHET RAYMO

Even the sparrow finds a home, and the swallow a nest, where she rears her brood beside thy altars.

Psalm 84: 3

Late last summer, in the west of Ireland, I spent a night in the Gallarus Oratory, a tiny seventh-century church of unmortared stone. It is the oldest intact building in Ireland, and one of the oldest in Europe. The oratory is about the size of a one-car garage, in the shape of an overturned boat. It has a narrow entrance at the front and a single tiny window at the rear, both open to the elements. Even during the day one needs a flashlight to explore the interior.

I can't say exactly why I was there, or why I intended to sit up all night, sleeplessly, in that dark space. I had been thinking about skepticism and prayer, and I wanted to experience something of whatever it was that inspired Irish monks to seek out these rough hermitages perched on the edge of Europe, or—as they imagined—the edge of eternity. They were pilgrims of the Absolute, seeking their God in a raw, ecstatic encounter with stone, wind, sea, and sky.

The Gallarus Oratory is something of a tourist mecca, but at night the place is isolated and dark, far from human habitation. From the door of the oratory, one looks down a sloping mile of fields to the twinkling lights of the village of Ballydavid on Smerwick Harbor.

What then did the monks of Gallarus think of the aurora, 1,300 years ago, at a time when the supernatural was the explanation of choice for exceptional phenomena?

The sun had long set when I arrived, although at that latitude in summer the twilight never quite fades from the northern horizon. It was a moonless night, ablaze with stars, Jupiter brightest of all. Meteors occasionally streaked the sky, and satellites cruised more stately orbits. Inside, I snuggled into a back corner of the oratory, tucked my knees under my chin, and waited. I could see nothing but the starlit outline of the door, not even my hand in front of my face. The silence was broken only by the low swish of my own breath.

As the hours passed, I began to feel a presence, a powerful sensation of something or someone sharing that empty darkness. I am not a mystical person, but I *knew* that I was not alone, and I could imagine those hermit monks of the seventh century sharing the same intense conviction of "someone in the room." At last, I was spooked to the point that I abandoned my interior corner and went outside.

A night of exceptional clarity! Stars spilling into the sea. And in the north, as if as a reward for my lonely vigil, the aurora borealis danced toward the zenith. How can I describe what I saw? Rays of silver light streaming up from the sea, as if from some enchanted Oz just over the horizon, shimmering columns of fairy radiance. As I watched from the doorway of oratory, I remembered something the nineteenth-century explorer Charles Francis Hall wrote about watching the aurora from the Arctic: "My first thought was, 'Among the gods there is none like unto Thee, O Lord; neither are there any works like unto thy works!'...We looked, we SAW, we TREMBLED."

Hall knew he was watching a natural physical phenomenon, not a miracle, but his reaction suggests the power of the aurora even on a mind trained in the methods of science. What then did the monks of Gallarus think of the aurora, 1,300 years ago, at a time when the supernatural was the explanation of choice for exceptional phenomena? Stepping out from the inky darkness of their stone chapel, they must surely have felt that the shimmering columns of light were somehow meant for them alone, a sign or a revelation, an answer to their prayers.

We have left the age of miracles behind, but not, I trust, our sense of wonder. Our quest for encounter with the Absolute goes arm in arm with our search for answers. We are pilgrim scientists, perched on the edge of eternity, curious and attentive. The Gallarus Oratory was built for prayer, at a time when the world was universally thought to be charged with the active spirit of a personal God: Every stone might be moved by incantation, every zephyr blew good or ill; springs flowed or dried up at the deity's whim; lights danced in a predawn sky as a blessing or portent. Today, we know the lights are caused by electrons crashing down from the sun, igniting luminescence. But our response to the lights might still be one of prayerful attention, and they lead us, if we let them, into encounter with the Absolute.

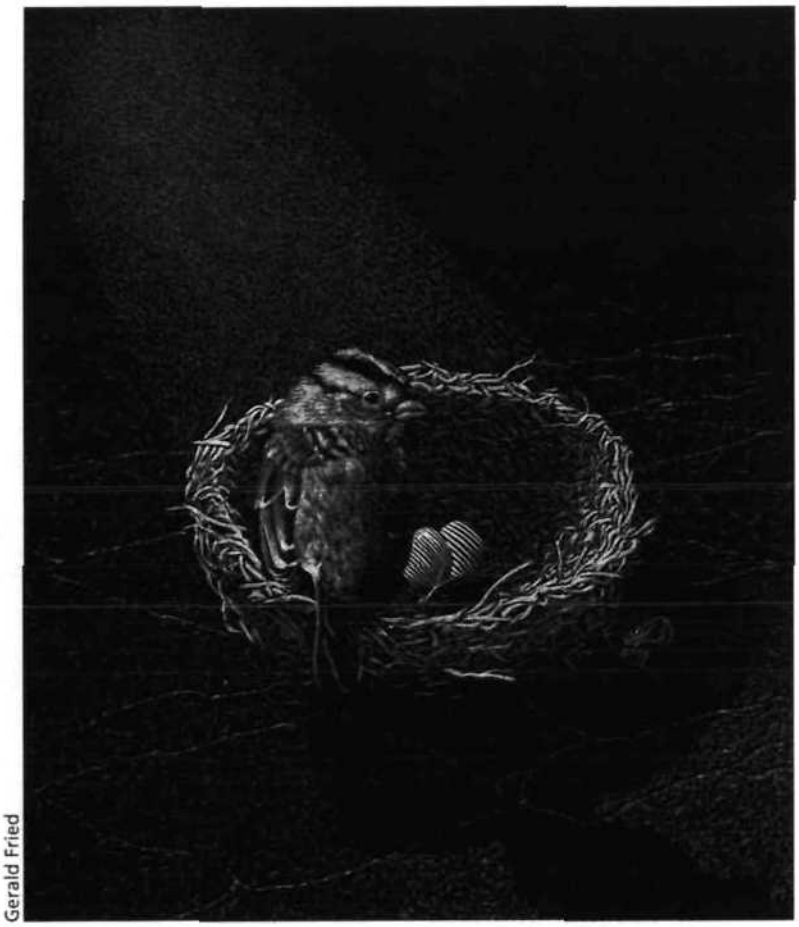
Traditional religious faiths have three components: a shared cosmology (a story of the universe and our place in it), spirituality (personal response to the numinous), and liturgy (public expressions of celebration and gratitude, including rites of passage). The apparent antagonism of science and religion centers almost entirely on cosmology: What is the universe? Where did it come from? How does it work? What is the human self? What is our fate? Humans have always had answers to these questions. The answers have been embodied in stories—tribal myths, scriptures, church traditions. All of these stories derived from a raw experience of the creation, such as my experiences inside and outside of the Gallarus Oratory. All of them contain enduring wisdom. But as a reliable cosmological component of religious faith they have been superseded by what cultural historian and Roman Catholic priest Thomas Berry calls the New Story—the scientific story of the world.

The New Story is the product of thousands of years of human curiosity, observation, experimentation, and creativity. It is an evolving story, not yet finished. Perhaps it will never be finished. It is a story that begins with an explosion from a seed of infinite energy. The seed expands and cools. Particles form, then atoms of hydrogen and helium. Stars and galaxies coalesce from swirling gas. Stars burn and explode, forging heavy elements—carbon, nitrogen, oxygen—and hurl them into space. New stars are born, with planets made of heavy elements. On one planet near a typical star in a typical galaxy life appears in the form of microscopic self-replicating ensembles of atoms. Life evolves, over billions of years, resulting in ever more complex organisms. Continents move. Seas rise and fall. The atmosphere changes. Millions of species of life appear

Chet Raymo is author of Skeptics and True Believers: The Exhilarating Connection Between Science and Religion *and other books such as* The Soul of the Night *and* 365 Starry Nights. *He is science columnist for the* Boston Globe *and teaches physics and astronomy at Stonehill College in Massachusetts.*

and become extinct. Others adapt, survive, and spill out progeny. At last, human consciousness appears. One species experiences the ineffable and wonders what it means, and makes up stories—of invisible spirits who harbor in darkness, of gods who light up the sky in answer to our prayers—eventually making up the New Story.

The New Story has important advantages over all the stories that have gone before:


Gerald Fried

• *It works.* It works so well that it has become the irreplaceable basis of technological civilization. We test the New Story in every way we can, in its particulars and in its totality. We build giant particle accelerating machines to see what happened in the first hot moments of the Big Bang. We put telescopes into space to look for the radiation of the primeval explosion. With spectroscopes and radiation detectors we analyze the composition of stars and galaxies and compare them to our theories for the origin of the world. Always and in every way we try to prove the story wrong. When the story fails, we change it.

• *It is a universal story.* Although originally a product of Western culture, it has become the story of all educated peoples throughout the world; scientists of all cultures, religions and political persuasions exchange ideas freely and apply the same criteria of verification and falsification. Like most children, I was taught that my story—Adam and Eve, angels, miracles, incarnation, heaven, hell, and all the rest—was the "true story," and that all others were false. Sometimes our so-called "true" stories gave us permission to hurt those who lived by other stories. The New Story, by its universality, helps put the old animosities behind us.

• *It is a story that emphasizes the connectedness of all people and all things.* Some of the old stories, such as the one I was taught as a child, placed humankind outside of space and time, gifted us with unworldly spirit, and gave us dominion over the millions of Earth's other creatures. The New Story places us squarely in a cosmic unfolding of space and time, and teaches our biological affinity to all humanity. We are ephemeral beings, inextricably related to all of life, to the planet itself, and even to the lives of stars.

• *It is a story that asserts our responsibility for our own lives and the future of the planet.* In the New Story, no omniscient deity intervenes at will in the creation, answers prayers, or leads all things to a predetermined end. We are on our own, in the immensity of creation, with an awesome responsibility to use our talents wisely.

• *It is a story that reveals a universe of unanticipated complexity, beauty and dimension.* The God revealed by the New Story is not the paltry personal projection of ourselves who attracted and bedeviled our ancestors. It is, in the words of the Jesuit theologian David Toolan, "the Unnamable One/Ancient of the Days of the mystics, of whom we can only speak negatively (not this, not that), a 'wholly other' hidden God of Glory," or in the felicitous phrase of novelist Nikos Kazantzakis, "the dread essence beyond logic."

We should treasure the ancient stories for the wisdom and values they contain. We should celebrate the creation in whatever poetic languages and rituals our traditional cultures have taught us. But only the New Story has the global authority to help us navigate the future. It is not the "true" story, but it is certainly the truest. Of all the stories that might provide the cosmological basis of contemporary religious feeling, it is the only one that has had its feet held to the fire of exacting experience.

The New Story informed my response to the dancing lights in the night sky at Gallarus. What I saw was not a portent or miracle, but rather nature's exquisite signature of the magnetic and material entanglement of Earth and sun.

As the sun brightened the eastern horizon and the last shreds of aurora faded, I was suddenly startled by a pair of swallows that began to dart in and out of the Gallarus Oratory, hunting insects on the wing. I followed them inside and discovered a nest with three chicks perched on a protruding stone just above the place I had been sitting. The mysterious presence I had felt so strongly in the darkness was not a god, nor spirit, nor succubus, nor demon, but the respirations and featherings of swallows. □

Should Skeptical Inquiry Be Applied to Religion?

Skeptical inquirers can and should examine religious claims, though the case can be made that CSICOP should not.

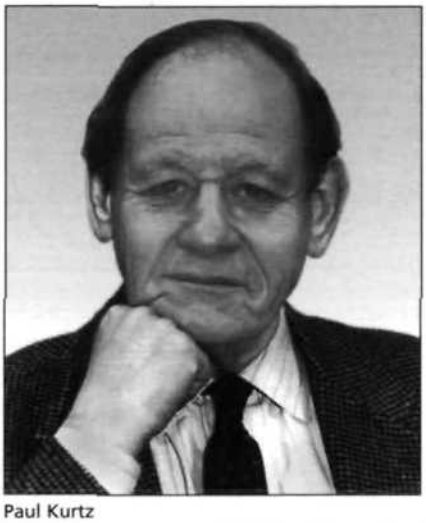
PAUL KURTZ

Scientific Inquiry

The relationship between science and religion has engendered heated controversy. This debate has its roots in the historic conflict between the advocates of reason and the disciples of faith. On the current scene, there is a vocal hallelujah chorus singing praises to the mutual harmony and support of these two realms or "magisteria." I have serious misgivings about this alleged rapprochement, but I wish to focus on only one aspect of the controversy, and ask: To what extent should we apply skepticism to religious claims?

By the term "skepticism" I do not refer to the classical

philosophical position which denies that reliable knowledge is possible. Rather, I use the term "skepticism" to refer to *skeptical inquiry*. There is a contrast between two forms of skepticism, (1) that which emphasizes doubt and the impossibility of knowledge, and (2) that which focuses on *inquiry* and the genuine possibility of knowledge; for this latter form of skepticism ("the new skepticism," as I have labeled it),[1] skeptical inquiry is essential in all fields of scientific research. What I have in mind is the fact that scientific inquirers formulate hypotheses to account for data and solve problems; their findings are tentative; they are accepted because they draw upon a range of confirming evidence and predictions and/or fit into a logically coherent theoretical framework. Reliable hypotheses are adopted because they are corroborated by a community of inquirers and because the tests that confirm them can be replicated. Scientific hypotheses and theories are fallible; and in principle they are open to question in the light of future discoveries and/or the introduction of more comprehensive theories. The point is that we have been able to achieve reliable knowledge in discipline after discipline because of the effective application of skeptical inquiry.


Paul Kurtz

Now the central questions that have been raised concern the range of skeptical inquiry. Are there areas such as religion in which science cannot enter? In particular, Should the skeptical movement extend its inquiry to religious questions? Some influential skeptics think we should not. In my view, skeptical inquirers definitely need to investigate religious claims. I do *not* think that CSICOP and the SKEPTICAL INQUIRER, however, should deal with religious claims; or if they do so, it should be only in a limited way. I shall deal with my reasons for these perhaps surprising statements later in this article.

Science has always had its critics, who have insisted that one or another area of human interest is immune to scientific inquiry. At one time it was proclaimed that astronomers could never know the outermost reaches of the universe (August Comte), the innermost nature of the atom (John Locke), or human consciousness (Henri Bergson). Critics have also insisted that we could not apply science to one or another aspect of human experience—political, economic, social, or ethical behavior, the arts, human psychology, sexuality, or feeling. I do not think that we should set a priori limits antecedent to inquiry; we should not seek to denigrate the ability of scientific investigators to explain behavior or to extend the frontiers of research into new areas.

Can There Be a Science of Religion?

Some have argued that religious phenomena—matters of faith—are entirely beyond the ken of science; but this surely is false because the scientific investigation of religion has already made great strides and there is a vast literature now available. We may talk about religion in at least two senses: First, religion refers to a form of *human behavior* that can be investigated. Second, it is used to refer to the *transcendental*, i.e., to that which transcends human experience or reason.

Let us turn to the first area. Religious behavior has been investigated by a wide range of disciplines: Anthropologists deal with the comparative study of primitive religions, examining prayer, ritual, the rites of passage, etc. Sociologists have investigated the institutional aspects of religious behavior, such as the role of the priestly class in society. Ever since William James, psychologists of religion have studied the varieties of religious experience, such as mysticism, ecstasy, talking in tongues, exorcism, etc. Similarly, biologists have postulated a role for religious beliefs and practices in the evolutionary process and their possible adaptive/survival value. They have asked, Does religiosity have a genetic or environmental basis? Others have focused on the neurological correlates of religious piety, and still others have attempted to test the efficacy of prayer.

One can deal with religion in contemporary or historical contexts. A great deal of attention has been devoted to the historical analysis of religious claims, especially since the great classical religions are based on ancient documents (the Old and New Testaments and the Koran), as are some of the newer religions (such as the nineteenth-century Book of Mormon). These texts allege that certain miraculous and revelatory events have occurred in the past and these warrant religious belief today; and it is often claimed that belief in them is based upon faith.

I would respond that scientific methodology has been used in historical investigations to examine these alleged events. Archaeologists seek independent corroborating evidence; they examine written or oral accounts that were contemporaneous with the events (for example, by comparing the Dead Sea Scrolls with the New Testament). The fields of "biblical criticism" or "koranic criticism" have attempted to use the best scholarly techniques, historical evidence, and textual and linguistic analysis to ascertain the historical accuracy of these claims.

Paranormal claims are similar to religious claims—both purport to be exceptions to natural laws. Skeptics have asked: Did D.D. Home float out of a window and levitate over a street in London in the late nineteenth century? Did the Fox sisters and Eusapia Palladino possess the ability to communicate with the dead? And they have sought to provide naturalistic interpretations for reports of bizarre events. No doubt it

Paul Kurtz is founder of CSICOP and author or editor of over 30 books. His most recent book is The Courage to Become *(Greenwood/Praeger), 1997.*

is easier to examine contemporaneous claims where the record is still available rather than ancient ones where the record may be fragmentary. Yet in principle at least, the religious investigator is similar to the paranormal investigator, attempting to ascertain the accuracy of the historical record. We use similar methods of inquiry to examine prosaic historical questions, such as: Did Washington cross the Delaware, or Thomas Jefferson sire the children of Sally Heming? The same goes for religious claims: Did the Red Sea part before the fleeing Hebrews, was there a Great Flood and a Noah's Ark? I don't see how or why we should declare that these historical religious claims are immune to scientific investigation.

Thus I maintain that insofar as religion refers to a form of human behavior, whether in the past or the present, we can, if we can uncover corroborating data or historical records, attempt to authenticate the historical claims and ask whether there were paranormal, occult, or transcendental causes, or whether naturalistic explanations are available. David Hume's arguments against miracles indicate all the reasons why we should be skeptical of ancient claims—because they lack adequate documentation, because the eyewitnesses were biased, and so on. And this should apply, in my view, to reports of revelation as well as miracles. Extraordinary claims that violate naturalistic causal regularities should require strong evidence. I don't see how anyone can protest that his beliefs ought to be immune to the standards of objective historical investigation, simply by claiming that they are held on the basis of faith. A good case in point is the alleged burial shroud of Jesus, the Shroud of Turin. Meticulous carbon-14 dating by three renowned laboratories has shown that the cloth is approximately 700 years old and therefore most likely a forgery. The fact that believers may seek to shield their belief by proclaiming that they have faith that the Shroud is genuine does not make it any more true. The same principle applies to the key miraculous revelations of the past upon which the classical religions are allegedly based. The strength of a hypothesis or belief should be a function of the empirical evidence extant brought to support it, and if the evidence is weak or spotty, then the faith claim should likewise be so regarded.

Religious belief systems are deeply ingrained in human history, culture, and social institutions that predate science, and thus it is often difficult, if not impossible, to insist upon using the standards of objective skeptical inquiry retrospectively. This is especially the case since to *believe* in a religion is more than a question of cognitive assent, for religion has its roots in ethnic or national identity; and to question the empirical or rational grounds for religious belief is to shake at the very foundations of the social order.

How to Deal with the Transcendental?

There is a second sense of religion that is nonbehavioral. Here the key question concerns the very existence of a "transcendental, supernatural, occult, or paranormal realm" over and beyond the natural world. The scientific naturalist argues that we should seek natural causes and explanations for paranormal and religious phenomena, that we should never abandon scientific methodology, and that we should endeavor to test all claims by reference to justifying evidence and reasons. We may ask, What is the truth value of theistic claims? In the great debate between scientific or philosophical skeptics and theists, agnostics/nontheists/atheists maintain that theists have not adequately justified their case and that their claims are unlikely or implausible. I will not here review the extensive classical argument or the kinds or evidence adduced.

I do wish, however, to focus on one point that has recently emerged in the literature. And this concerns a prior question raised by analytic philosophers about the meaning of "God language." Any scientific inquiry presupposes some clarity about the meaning of its basic terms. Is religious language to be taken literally, descriptively, or cognitively; and if so, are we prepared to assert that there is some "transcendental ground, cause, creator, or purpose" to the universe? Most linguistic skeptics have sought to deconstruct religious language and have had difficulty in determining precisely to what the terms "God" or "divinity" or "transcendental being" refer. Similarly for the vague, often incoherent, use of the term "spirituality," so popular today. They appear to be indefinable, even to theologians, and hence before we can say whether He, She, or It exists, we need to know precisely what is being asserted. Most God talk is nonfalsifiable, in that we would not know how to confirm or disconfirm any claim about His presence or existence. God talk is by definition difficult or impossible insofar as it transcends any possible experience or reason and lurks in a mysterious noumenal realm. There are surely many things that we do not know about the universe; but to describe the unknown as "divine" is to take a leap of faith beyond reasonable evidence.

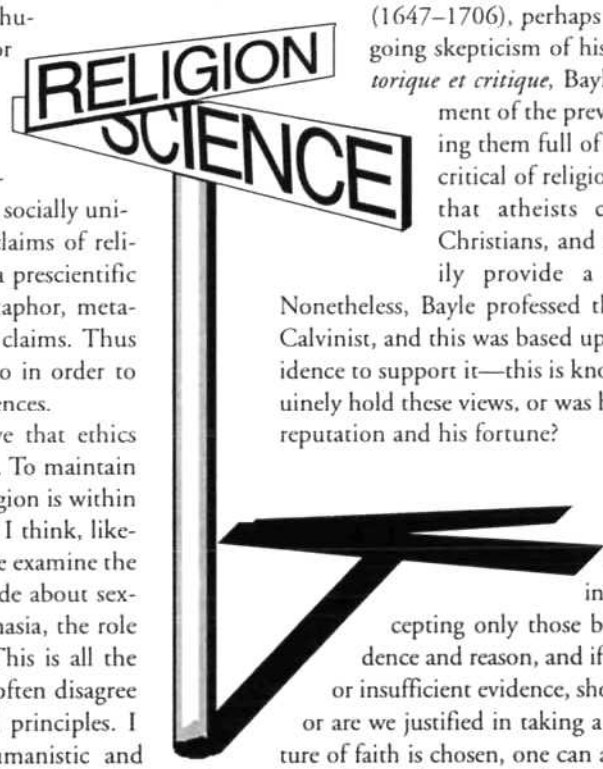
Linguistic skeptics have held that if we are to make sense of religious language, we must recognize that it has other nondescriptive or noncognitive functions. It does not convey us truth about the world (thus competing with science or ordinary experience), but is evocative, expressive, or emotive in character, or is performatory and celebrative in a social context, or is moral in its imperative function, or it has poetic metaphorical meaning. Thus God talk should be construed primarily as a form of personal and social moral poetry. If this is the case, then religion does not give us knowledge or truth; instead it expresses mood and attitude.

I am not talking about the historical truth of Jesus' alleged resurrection or Joseph Smith's encounter with the angel Moroni or Mohammed's communication with Gabriel—these are concrete historical claims and in principle at least are available to empirical and rational inquiry and have some experiential content (even though the evidence may be fragmentary or incomplete), but of "divinity" viewed outside of history as a transcendental being or spiritual reality. It is the latter that is incomprehensible almost by definition.

Thus religion should not compete with science about the description and explanation of natural processes in the universe. Science deals most effectively with these questions, not religion. To claim to believe in the theory of evolution, and yet insist the "human soul" is an exception to evolutionary principles because it is created by a deity, is an illegitimate intrusion

of an occult cause. Similarly, to seek to transcend the "big bang" physical theory in science by postulating a creator is to leap beyond the verifiable evidence. To say that this is justified by faith is, in my judgment, unwarranted—the most sensible posture to adopt here is that of the agnostic.

In the last analysis, religion and science are different forms of human behavior and have different functions. We may analogically ask, What is the relationship between science and sports, or science and music? These are different forms of experience, and they play different roles in human behavior. Surely neither sports nor music compete in the range of truth claims. In this sense, religion should not be taken as true or false, but as evocative, expressive, uplifting, performatory, good or bad, beautiful or ugly, socially unifying or disruptive. Historically, the claims of religion were taken as true, but this was a prescientific posture drawing upon myth and metaphor, metaphysics and speculation, not testable claims. Thus "religious truth" cannot be appealed to in order to contest the verified findings of the sciences.



I should add that I do not believe that ethics need be based on religious faith either. To maintain that the proper or exclusive role of religion is within the realm of morality (or meaning) is, I think, likewise questionable, particularly when we examine the concrete ethical recommendations made about sexual morality, divorce, abortion, euthanasia, the role of women, capital punishment, etc. This is all the more so, given the fact that religions often disagree violently about any number of moral principles. I believe that there are alternative humanistic and rational grounds for ethical judgment, based in part on scientific knowledge, but that is a topic for another paper.

Skeptical Inquiry and Religion

The key question that I wish to address is, Should skeptical inquirers question the regnant sacred cows of religion? There are both theoretical and prudential issues here at stake. I can find no theoretical reason why not, but there may be practical considerations. For one, it requires an extraordinary amount of courage today as in the past (especially in America!) to critique religion. One can challenge paranormal hucksters, mediums, psychics, alternative therapists, astrologers, and past-life hypnotherapists with abandon, but to question the revered figures of orthodox religion is another matter, for this may still raise the serious public charge of blasphemy and heresy; and this can be dangerous to one's person and career—as Salman Rushdie's *fatwah* so graphically demonstrates.

History vividly illustrates the hesitancy of skeptics to apply their skepticism to religious questions. In ancient Rome, Sextus Empiricus, author of *Outlines of Pyrrhonism*, defended the suspension of belief in regard to metaphysical, philosophical, and ethical issues. He did not think that reliable knowledge about reality or ethical judgments was possible. He neither affirmed nor denied the existence of the Gods, but adopted a neutral stance. Since there was no reliable knowledge, Pyrrho urged that compliance with the customs and religion of his day was the most prudent course to follow. The great skeptic Hume bade his friend, Adam Smith, to publish his iconoclastic *Dialogues Concerning Natural Religion* after his death (in 1776), but Smith declined to do so, disappointing Hume. Hume's nephew David arranged for posthumous publication. The French author Pierre Bayle (1647–1706), perhaps expressed the most thoroughgoing skepticism of his time. In his *Dictionnaire historique et critique*, Bayle presented a scathing indictment of the prevailing theories of his day, finding them full of contradictions. He was highly critical of religious absurdities. He maintained that atheists could be more moral than Christians, and that religion did not necessarily provide a basis for ethical conduct. Nonetheless, Bayle professed that he was a Christian and a Calvinist, and this was based upon pure faith, without any evidence to support it—this is known as fideism. Did Bayle genuinely hold these views, or was his fideism a ruse to protect his reputation and his fortune?

This form of fideism, I maintain, on theoretical grounds is illegitimate, even irrational. For if, as skeptical inquirers, we are justified in accepting only those beliefs that are based upon evidence and reason, and if there is no evidence either way or insufficient evidence, should we not suspend judgment, or are we justified in taking a leap of faith? If the latter posture of faith is chosen, one can ask, On what basis? If a person is entitled to choose to believe whatever he or she wishes, *solely* or *largely* because of personal feeling and taste, then "anything goes." But this anarchic epistemological principle can be used to distort honest inquiry. (The implication of this argument is that if we do *not* have a similar feeling, we are entitled *not to believe*.) One may ask, Can one generalize the epistemological rule, and if so, can it apply to paranormal claims? Is someone thus entitled to believe in UFO abductions, angels, or demons on the basis of feeling and fancy? The paranormal skeptic retort is that where there is evidence to decide the question, we are not justified in believing; though in a democracy we are not entitled to expect others to share our skepticism.

But as a matter of fact, most of those who believe in the traditional religions do not base it on pure fideism alone, but on reasons and evidence. Indeed, no less an authority than Pope John Paul II maintained the same in a recent encyclical entitled "Faith and Reason." In this, the Pope condemns both fideism and atheism. He attacks the naive faith in "UFOs, astrology, and the New Age." He criticizes "exaggerated rationalism" and pragmatism on the one hand and postmodernism on the other, but he also condemns the exclusive reliance on faith. The Pope maintains that reason and scientific inquiry support rather than hinder faith in Christian revelation and

Catholic doctrine. Skeptics might agree with the Pope's defense of reason and scientific inquiry, but question whether these do indeed support his own beliefs.

Thus, in my judgment, acquiescence by skeptics to the fideist's rationalization for his beliefs is profoundly mistaken. Similarly, in answer to those theists who maintain that there is adequate evidence and reasons for their belief, skeptical inquirers should not simply ignore their claims, saying that they are beyond scientific confirmation, but should examine them. Since the burden of proof is always upon the claimant, skeptical inquirers may question both the fideist and the partial-evidentialist in religion, if they do not believe that they have provided an adequate justified case.

Conclusion

The upshot of this controversy, in my judgment, is that scientific and skeptical inquirers should deal with religious claims. Not to do so is to flee from an important area of human behavior and interest and is irresponsible. Indeed, one reason why paranormal beliefs are so prominent today is because religious beliefs are not being critically examined in the marketplace of ideas.

As I have said, I do not believe, however, that CSICOP or the SKEPTICAL INQUIRER should in any way, except tangentially, deal with religious issues. But my reasons are pragmatic, not theoretical. It is simply a question of the division of labor. We lack the resources and expertise to focus on the entire range of scientific questions about religion: biblical archaeological, biblical and koranic criticism, linguistics, psychology, anthropology, sociology, the genetic or environmental roots of religion, etc. It would take us too far afield. We have focused on fringe science and specialized in the paranormal, and we have made important contributions here. Skeptical inquiry in principle should apply equally to economics, politics, ethics, and indeed to all fields of human interest. Surely we cannot possibly evaluate each and every claim to truth that arises. My reasons are thus practical.

But at the same time I disagree with those who counsel caution in applying scientific skepticism to the religious domain. In my view science should not be so narrowly construed that it only applies to experimental laboratory work; it should bring in the tools of logical analysis, historical research, and rational investigation. In this sense, I submit, religious claims are amenable to scientific examination and skeptical inquiry.

It is possible for a scientist to apply skeptical, scientific inquiry to his or her own specialty with considerable expertise; yet he or she may not be qualified to apply the same methods of rational inquiry to other fields, and indeed may harbor religious beliefs that lack evidential support. Although disbelief about religious claims is higher among scientists (an estimated 60 percent) than the general population (perhaps 10 percent), some scientists fail to rigorously examine their own religious beliefs. They may use rigorous standards of inquiry in their particular fields of expertise, yet throw caution to the wind when they leap into questions of religious faith.

One last issue: to claim that skepticism is committed only to "methodological naturalism" and not scientific naturalism (which sums up the evidence for the naturalistic world view and critiques the theistic/spiritualistic leap beyond) is, I think, profoundly mistaken. To adopt this neutral stance in the current cultural milieu is a cop-out; for questionable religious claims are proliferating daily and they are not adequately evaluated by skeptical scientists. In my view, we need more skeptical inquirers who possess the requisite expertise and are able to apply their investigative skills to religious claims. Such skeptical inquiry is sorely needed today. It could play a vital role in the debate between religion and science.

Note

1. Paul Kurtz, *The New Skepticism: Inquiry and Reliable Knowledge* (Amherst, N.Y.: Prometheus Books, 1992).

Don't Think About Pseudoscience...

Without Skeptical Inquirer

the magazine for science and reason

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The 'Science and Religion Movement'

An Opportunity for Improved Public Understanding of Science?

The "science and religion movement" of the late 1990s can help improve the climate for acceptance of science and of evolution as a valid science. The theistic science movement, however, is different; it needs monitoring, and its growth would be detrimental to science.

EUGENIE C. SCOTT

What are we talking about when we talk about "science" and "religion"? Science is a way of knowing that attempts to explain the natural world using natural causes. It is agnostic toward the supernatural—it neither confirms nor rejects it. So science is methodologically materialistic: matter, energy, and their interactions are used to explain nature. Supernatural causes are ruled out for philosophical as well as practical reasons: science requires testing of explanations against the natural world, and testing requires that some variables be held constant. Supernatural forces by definition cannot be held constant, thus supernatural explanation is outside of what science can deal with. Mostly, methodological materialism is

embraced by scientists because it works so well; we have found out a great deal about how the universe operates. To say "God did it" does not lead us to greater understanding and tends to discourage further research. Even conservative theologian Alvin Plantinga agrees that resorting to direct supernatural causes to explain the natural word is a "science stopper" (Plantinga 1997).

As an anthropologist, I define religion as a set of rules and beliefs a people have about a nonmaterial universe and its inhabitants. These may include gods, ancestors, powerful spirits, and other supernatural forces. Usually religion includes ideas about an afterlife, but not always. Religion often but not always includes rules about how people should treat one another (ethics and morals). Religion often but not always includes explanations of the natural world. Religious beliefs almost always include a sense of the "spiritual"—awe, wonder, reverence, faith, and other emotions. (Most Americans are Christians, and although "religion" obviously is far broader than just Christianity, my discussion must for reasons of space be limited to this tradition.)

Aren't scientists all secularists? Apparently not. A strong core of scientists are believers.

It would appear that science and religion have little in common, yet in the late 1990s there is substantial activity taking place between them. The American Association for the Advancement of Science has an office to promote "Dialogue Between Science and Religion," and in November of 1997 it hosted a major national conference in Chicago titled, "The Epic of Evolution." Physical, biological, and social scientists were teamed with theologians to discuss the scientific and theological implications of evolution. Dozens (maybe even scores) of "science and religion" conferences have been held since then, including a large "Science and the Spiritual Quest" conference held on the campus of the University of California sponsored by the Berkeley-based Center for Theology and the Natural Sciences (CTNS). *Science*, *Newsweek*, *Time*, and *US News and World Report* have also covered what has come to be called the "science and religion movement."

To some, this is a puzzling development. After all, isn't religion supposed to be in conflict with science, and aren't scientists all secularists? Apparently not. A strong core of scientists are believers. In 1914, the sociologist James H. Leuba surveyed scientists listed in *American Men and Women of Science* and found that 42 percent believed in a personal God—much less than in the general public, but still a substantial number. He predicted that through time, fewer scientists would believe in God—but when Leuba's (albeit problematic) questionnaire was readministered to a group of scientists in 1996, researchers found no appreciable change in the number of "believing" scientists—about 39 percent (Larson and Witham 1997). Many scientists don't see religion and science as inherently incompatible.

In fact, this incompatibility view is found in only one of four ways that (Christian) religion and science historically have interacted.

1) The "warfare" model, as illustrated in Andrew D. White's 1896 classic *A History of the Warfare of Science with Theology in Christendom*, presents religion and science as being incompatible. This perspective is echoed today by Phillip Johnson, Richard Dawkins, Paul Kurtz, and many others. Depending on which side of the issue one is on, one concludes either that religion trumps science, or that science trumps religion.

2) The "separate realms" model understands science and religion to focus on different areas of human concern, with science explaining the natural world, and religion dealing with spiritual matters. Here, science and religion don't conflict, because they have little to say to one another. Stephen Jay Gould is a proponent of this view.

3) The "accommodation" model, in which science and religion are more directly engaged; theological understanding is thought to be deepened through the understanding of science. Some Christians wrestling with the theological implications of Darwinism in the early twentieth century, for example, were willing to reinterpret basic concepts of the Fall, Atonement, and Original Sin in the light of evolutionary theory. These theologians were considering such problems as "If humans evolved from apes, there was no original state of grace and the concept of Original Sin must be reinterpreted" (Bowler 1999, 39). The accommodation seems to be largely a one-way street, with science acting as a source for theological reinterpretation rather than the reverse.

4) In the "engagement" model, science and religion interact as equal partners, stimulating each other to ask different questions than they otherwise might, with the idea that the interaction of both epistemologies will contribute to a fuller understanding of both the natural and nonmaterial realms. This view is reflected in the quotation often attributed to Einstein that "Religion without science is crippled, while science without religion is lame." Scientist and ordained minister Robert J. Russell, of CTNS, said in his introduction to the "Science and the Spiritual Quest" (SSQ) conference:

> For some scientists, the universe as such is the answer. It alone is our source, and science offers us sufficient meaning and purpose. For other scientists, many of whom are gathered here today, science is part of the answer, but a truly adequate account requires language about the God whom Jews, Christians, and Moslems praise as the Creator of the universe and the ultimate source of meaning and purpose in our lives and world. The primary purpose of SSQ is to explore this second option. . . . Many scholars now see theological doctrines, like scientific theories, not as rigid, closed dogmas but as hypotheses about the world which, while firmly believed to be true, are radically subject to testing by the appropriate data. For at least some of these theologians, the "data" should now

Eugenie Scott, a CSICOP Fellow and member of the Executive Council, is Executive Director of the National Center for Science Education, Inc., El Cerrito, Calif. She is a physical anthropologist. E-mail: scott@natcenscied.org.

include the theories and discoveries of the natural sciences. They also see science as infused with concepts and assumptions whose roots, though often unacknowledged, lie in philosophy and, more indirectly, in Western monotheism, and which invite a critical discussion between theologians, philosophers, and scientists. (Russell 1998, 27)

Most scholars in the "science and religion movement" would identify with the "accommodation" and "engagement" schools, and though some are theologically conservative, very few of them are from biblical literalist Christian traditions. The mainstream science and religion conferences do not include creation science proponents such as Henry Morris and Duane Gish of the Institute for Creation Research. But even neocreationists like Phillip Johnson and others in the "intelligent design" movement are absent from these conferences. These and other conservative Christians are found in a "parallel universe" such as the "Naturalism, Theism and the Scientific Enterprise" conference at the University of Texas-Austin in February 1997. They promote a very different kind of integration of religion and science called "theistic science," which thus far has been shunned by the mainstream science and religion movement. "Theistic science" is an effort to move science away from methodological materialism and allow in the occasional supernatural explanation — especially for topics such as evolution that have theological implications (Scott 1998). In my opinion, it would be the supreme "science stopper."

There is only one science, but there are many religious views. The science and religion movement is varied because Christian theology is varied. Individuals identifying themselves as Christian hold a variety of concepts of what it means to be a Christian. In my public presentations I often show slides of sign boards from two different Christian churches that vividly illustrate contrasting views of the role (and value) of reason. One, from a fundamentalist church, reads, "Guard Your Mind Or It Will Rule You," a chilling attitude to any lover of reason. The other, from a liberal Protestant church reads, "He Came To Take Away Your Sins, Not Your Brains."

People identifying themselves as Christian also hold a variety of views of God. Some hold to the familiar creator God of special creationism — a Sistine chapel-like anthropomorphic figure who creates Adam in his literal likeness. The traditional view of God as omniscient, omnipotent, and omnibenevolent is likely held by most Christians, but theologians and ministers can be found who doubt one or more of those characteristics. There are Christians who see God as a pervasive power, grander than Michaelangelo's anthropomorphic figure, but not especially personal (as one minister described it to me, with a twinkle in his eye, "the Force be with you!"). Others who consider themselves religious, if not exactly Christian, have a pantheistic view of "God" as the universe itself, including the laws of the universe. Scientists active in the science and religion movement can be found holding each of these perspectives, and others as well.

My particular interest in science is evolution, and polls clearly show that almost half of Americans deny that evolution occurred. About 40 percent think that evolution occurred, and was guided by God, and an additional 10 percent or so agree that evolution occurred, but deny any role for God. Antievolutionism in the US and Canada is sustained by the idea that evolution and religion (Christianity) are incompatible; creationists such as Henry Morris demand that people choose between evolution (which is equated with atheism) and Christianity. This is a false dichotomy, of course, as illustrated by the many religious scientists and clergy who accept that evolution occurred. The mainline component of the science and religion movement takes for granted that evolution occurred, and the majority endorse methodological materialism rather than supernatural intervention to explain the natural world. In my observations of the movement, I have seen no support for doctrines such as creation science.

I believe that the science and religion movement will help the public understand the broader range of opinions about evolution among religious individuals, and in this manner improve the climate for the acceptance of evolution as valid science that should be taught in public schools. The theistic science movement, however, needs careful monitoring, as its growth would be detrimental to science as a whole, and to the public understanding of science.

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Allow Historical Figures Their Integrity

"Sacred and secular powers have both claimed support from historic facts such as the spirituality of many great scientists or the secularizing tendencies of scientific criticism. Yet such hijacking of history can be terribly facile. There has indeed been a genuine spirituality in the work and outlook of scientific giants, which can make them attractive to religious apologists. But that same spirituality has often been idiosyncratic rather than orthodox to one particular confession, with the consequence that their lives can also be claimed by the militant secularist. It would be more honest to allow historical figures their integrity."

—John Brooke, Professor of the History of Science, Lancaster University, in "Science and Religion: Lessons from History?" Science, 282:1985–1986, December 11, 1998

Science and the Versus of Religion

A Conversation with My Students

The courts have ruled that creationism isn't science, so its proponents want to change science's standards to include the supernatural. Beware: they may have a receptive audience, even among college students.

BARRY A. PALEVITZ

In the perpetual skirmish between science and religion, biological evolution is a contentious battleground. Despite a series of legal victories for science, which many thought or hoped were the final nails in the coffin of creationism, hostilities still flare. Maybe it's millennialism. Perhaps it reflects unease with modern science and technology. Vigorous anti-science rhetoric coming from the humanities in the guise of postmodernism (see Gross and Levitt 1994; Sokal and Bricmont 1998), some of it anti-evolution in flavor, may be fueling the fire. Whatever the causes, attacks on evolution haven't ceased. Donald Aguillard, litigant in the landmark 1987 *Edwards* v. *Aguillard* Supreme Court decision on evolution, told the 1998 National

Association of Biology Teachers convention in Reno that creationism is thriving in local school districts (see Aguillard 1999). Academia isn't immune either (Berlinski 1996)—here at the University of Georgia, a vocal minority of fundamentalist faculty proclaims the evils of evolution at every opportunity. In response to the controversy, America's premier scientific society recently published yet another forceful statement on the matter (National Academy of Sciences 1998).

Because teaching creationism in the public schools is an unconstitutional infringement on the separation of church and state according to the Supreme Court, opponents of evolution no longer approach the issue head-on. One of their tactics is to lower the status of evolution by labeling it "only a theory," a rhetorical trick going back to the 1925 Scopes trial (Larson 1998). Another ploy has been to resurrect the threadbare Argument from Design, which was effectively dismissed on philosophical grounds in the eighteenth century (Hume 1779). But, having lost the "what good is half an eye" battle to developmental biology, creationists have retreated to an equally bogus "intelligent design theory" (Bunk 1998) applied to biochemical pathways and cell structures, most notably in *Darwin's Black Box* (Behe 1996). Of course, for strategic reasons creationists avoid mentioning God as the designer.

After participating in and watching debates with creationists eager to argue about supposed gaps in the evidence for evolution and natural selection, I concluded that arguing about the data is pointless because creationists filter information through a predisposition that has nothing to do with science. It's a matter of what my friends in the humanities call "world view." Creationists will always see inconsistencies or unexplained phenomena in evolutionary biology that make supernatural intervention an unavoidable conclusion. Science is an easy target in that regard because everything it says is couched in probabilities—certainty isn't in our vocabulary. The public traditionally views science and medicine as authoritative, so uncertainty is easily misinterpreted and manipulated (Toumey 1996). According to increasingly popular mantra, that uncertainty, the fact that we still can't answer all the questions and explain everything about the natural world, by default leads to God (see Johnson 1998b).

The debate, if there is to be one, should instead center on the basic philosophies of science and religion that make them fundamentally different pursuits. In a recent article in *Discover*, physical anthropologist Matt Cartmill (1998), while lamenting the attacks on evolution by the religious right and now by a new opponent, the academic left, also goes on to chide scientists for ruling God out of the evolutionary equation. To do so is a personal, not a scientific, statement, he says. I think Cartmill is mistaken. Creationists want to redefine science in the public eye in order to accommodate their religious views. Since creationism has failed to gain credibility as science according to commonly accepted norms, proponents want to change the rules by altering the public's perception of the nature of science. By calling the scientific concept of purposeless evolution "an article of faith," and by insisting that Stephen Jay Gould's ideas are "a profession of his religious beliefs," Cartmill's position plays right into their hands.

An incident in my honors botany class helps focus the relationship between science and religion. A genetics faculty member delivered a lecture on God and genes. Because genes explain so much of what used to be God's turf, he argued, we should re-examine religion in that light (see Avise 1998). Knowing the lecture would be thought provoking, I asked my students to attend and write a brief essay voicing their opinions. Many students wrote that the speaker had wrongly excluded religion from the realm of science. I was so surprised that I spent the next class period revisiting the subject.

Religion in Science

As we sat outside on a pleasant afternoon, I fielded questions from the students about the place of religion in science. Some of the ground we covered was familiar to them, but a lot of it wasn't. I first floated the standard argument that science and religion see the world in very different ways and use contrasting methods and standards. Science offers material explanations based on objective observation and measurement; if it accepts the supernatural, troubling questions arise. For example, which of the world's many creation stories qualifies as the official alternative to evolution? In the US, the public would vote for Genesis, but do we prefer the literal interpretation espoused by the fundamentalists or one with a more allegorical spin? Another problem: If we add religion to the mix, why not astrology or other nonscientific viewpoints? My students weren't satisfied.

As we talked, I tried to get them to more fully understand the holy grail of data in science and the concept that understanding may arrive with the next observation or measurement. That's why we spend ceaseless hours and dollars pursuing new ways to sequence genes and view distant galaxies. That's also why supernatural explanations are unnecessary and counterproductive. If the answer isn't obvious because of insufficient data, we wait for the data to appear in the literature or do the necessary experiments ourselves. We don't punt in favor of the supernatural, as Behe did. History clearly shows that with enough time and data, the unexplained is demystified. No natural phenomenon, *not one*, has ever been shown to have a supernatural cause based on objective, material evidence. On the contrary, fear, superstition, and myth surrounding everything from lightning to disease have consistently fallen to rational inquiry. As for all the unanswered questions, that's what science is about! Old questions are answered (or old answers modified) as new ones arise. The ex-editor of *Nature*, John Maddox, put it well: "As in the past, deepened understanding will provoke questions we do not yet have the wit to ask" (Maddox 1998).

Barry Palevitz is a professor in the Department of Botany, University of Georgia, Athens, GA 30602. His interests include cell biology and science communication. He and Ricki Lewis are co-authors of a forthcoming book, Discovery: Science as a Window to the World, *to be published by Blackwell.*

Creationists have consistently made us defend evolution when in fact the burden of proof is on them. Evolution is the accepted scientific explanation for how life arrived on the scene, and it's supported by a mountain of data. If creationists believe their ideas are correct, it is they who have to make a convincing case. Because the name of the game is science, we should force them to play by science's rules and demand that they defend their position based on positive scientific evidence; supposedly unexplainable phenomena and attacks on evolution aren't enough. Behe's book attracted a lot of media attention (and sales) despite the absence of any positive evidence in favor of supernatural design. But then again, is that surprising? Ultimately, the supernatural cannot be tested by the material methods of science, and we should force creationists to admit it.

Brad Marshall

One of my students asked if I "believe in" evolution. Instead, I pointed out a problem with his choice of words. Scientists do not believe in evolution; they believe it. That's not just a matter of semantics but a real distinction. To believe in evolution implies faith, like believing in fairies. Scientists believe evolution because overwhelming data support it, and they will do so until data say otherwise. Creationists like to argue that scientists accept evolution in the believe-in mode, i.e., as a matter of faith. Those who make that argument confuse and mislead. Darwin published his ideas on the basis of his own and previous observations. And while mechanisms are hotly debated, the data since then support evolution; it's not a matter of faith.

Compromising Science

My students were still troubled—thinking that there must be room for religion *somewhere* in science. Surely a little religion here and there wouldn't hurt. I tried to explain that there's no such thing as just a little religion in science. Open a crack in the evidentiary standards of science and somebody will drive a tank through it. Open it a little, and a flood of vested interests will line up for equal time.

But surely you can *compromise*, Professor Palevitz? After all, isn't that *fair*? My response was to consider the problem that proposition raises: How should I compromise? Which bit of scientific turf should I concede? Which scintilla of objective evidence should I ignore in favor of the subjective and untestable? After all, we're not talking about horse trading over Congressional appropriations where swapping a dam for an F-16 is the norm. No, this kind of compromise is much more difficult, comparable to the Sophie's choice dilemma of a parent forced to choose between children. It's an impossible choice for the parent, and equally impossible for the scientist.

Some creationists are willing to admit that Earth is really as old as science shows. Some even concede that other species may have evolved, but God stepped in for *Homo sapiens*. Isn't that good middle ground, professor? The answer is no. If we accept supernatural intervention for humans, why not for other organisms? After all, there is no scientific justification for removing humanity from the rest of biology. If we accept a little of the subjective, why not go whole hog and admit that Earth may indeed be only 6,000 years old and fossils are a divine trick to test our faith, as some creationists hold? Creationism comes in various flavors, and there is no clear line separating the somewhat palatable from the just plain awful. The only choice is to stick to objective scientific evidence.

The basic flaw in Cartmill's position in *Discover* is that science isn't free to yield the inch of ground he calls for. Science has no basis for acknowledging the possible influence of God in evolution, no matter how small or hypothetical. It's not that science excludes God so much as it has no way of dealing with the concept. Since it cannot be approached by scientific principles and methods, the supernatural is automatically off limits as an explanation of the natural world. It's not a factor in the equation; it's not in the same ballpark. All science can go on is material evidence, which says that the supernatural is not necessary for explaining biological diversity. We can acknowledge supernatural beliefs about life, but those beliefs are irrelevant scientifically.

A bit more should be said about the word "fair" since it's often trotted out to convince people that creationism should be taught side by side with evolution. After all, what can be wrong with giving students both sides of the story—it's democratic; it's the American way. *But it's not that simple.* Again, there are many religious traditions, not one. Which do we anoint as the official version, or do we discuss all of them? At a more fundamental level, is science really about fairness and democracy? Hardly. True, science is a free marketplace of ideas and many people have a voice in that marketplace. Scientists debate alternative hypotheses, and often, in the absence of a

clear winner, some form of agreement emerges as a basis for new experiments. But there the similarity to a New England town meeting ends, because an idea, consensus notwithstanding, lasts only as long as data support it. Fairness has nothing to do with it. Religion doesn't make the grade because it offers no data. It simply isn't science.

The fairness argument is also hypocritical. Pre-college students study science perhaps one hour each school day, and only a tiny percentage of the time is devoted to evolution. In contrast, they spend about seventeen hours a day and all weekend outside of school, free to hear the "alternative." Yet creationists covet even the small amount of time in biology class, in the name of fairness.

To me, the differences between science and religion are stark, but many people miss the distinction. Perhaps we are not doing a good enough job explaining the nature of scientific inquiry and rational problem solving to our students. We teach facts and principles in our science classes, but apparently not enough about the philosophical underpinnings of the scientific process and the way scientists view the natural world. The little philosophy we do teach often is a stale version of the "scientific method" that only vaguely resembles the way things really happen. We confer on our graduate students the degree of Doctor of Philosophy, yet what kind of philosophical training do we provide? Many of them will become teachers or otherwise interpret science for the public, but can they explain how science works?

A recent survey of Pennsylvania high school teachers (Osif 1997) showed that nearly 40 percent agreed that creationism should be taught in the public schools, a figure consistent with data from other states (also see Aguillard 1999). Surprisingly, more than 20 percent of the Pennsylvania science teachers did not accept the principle that evolution is central to the study of biology. According to the survey's author, "this inability or refusal to judge information on its scientific validity is chilling." Opinions about evolution did not depend on the teachers' academic training. In other words, learning facts and concepts wasn't enough. Instead, Osif suggested that "study of the nature, rules, and philosophy of science may be one step in addressing this issue," a conclusion emphasized by the National Academy of Sciences in its 1998 report.

Perhaps the most pernicious message of creationists is this: If only we deny it, evolution will go away. If enough people are convinced, nature will follow suit. The radical postmodernists have a similar fantasy: If their objections to biological determinism (essentialism) are loud enough, perhaps genetic influences on human behavior will disappear (Rosser 1986; Nelkin and Lindee 1995). This kind of message should send shivers down the spine of anybody interested in honest, objective inquiry. Science *discovers* the principles upon which the universe operates, it doesn't construct them, and it's not free to ignore them. Nobody, scientists included, has the ability to legislate how the natural world operates based on religious or political belief. One cannot simply insist that the emperor is wearing a fine set of clothes and expect it to be true. We cannot substitute how we would like the world to be for how it actually is.

Differing Spheres

Unfortunately, scientists themselves often fray the boundaries between science and religion, for example, by referring to "God particles" or the mind of God. In an effort to bridge the gap between science and religion, some claim that science supports scripture and can even summon proof of God's existence (Schroeder 1997; Begley 1998; Gibbs 1998; Johnson 1998a). Others embrace the anthropic principle, a quasi-supernatural belief that the universe was created just so with us in mind (Glynn 1997). In an effort to seem evenhanded or fair when discussing evolution, some of my colleagues tell students that religion and science are equally worthwhile ways of pursuing knowledge and truth. Cartmill's call for compromise and humility by scientists is another side of the same coin. But is that approach really useful? I think not. We should more correctly point out that religion and science are equally valid *at what they do individually, but not in each other's sphere.* Science is an excellent system for explaining the natural world, as history has amply shown, but it says nothing about morality. Conversely, religion may be a useful framework for moral guidance, but it is a poor system for systematically investigating the natural world. To maintain that Genesis (or other creation accounts) and science are equally valid in explaining how life arrived at its present state only muddies the waters. Different, yes; equal, no.

As the sun waned that afternoon, a final misunderstanding surfaced. A student wanted to know why scientists are so spirituality bereft. Shocked, I responded by distinguishing between spirituality and religion. It is religion that has no place in science; spirituality is not only possible but even advantageous if it reinforces love of the natural world and motivation to find out how it works. I consider myself a very spiritual person: I am awed every time I snorkel on a coral reef, humbled by a crisp December night full of stars, forever amazed by a dividing cell, and inspired by human creativity. Like physicist Richard Feynman (see Sykes 1994), my appreciation of nature's beauty is magnified by knowledge of its mechanisms. I resent the implication that scientists have no spiritual dimension, and if the war being waged against science by segments of the religious and academic communities helps spread that myth, scientists have even more reason to resist it.

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Science vs. Religion

Teach the Difference, Resolve the Conflict

Most students leave our universities unaware of the differences between religious and scientific truths—and with virtually no knowledge of how the latter are obtained. These thoughts and materials should help.

ZORAN PAZAMETA

In today's world, humankind is better off by far than it has ever been, and education more widely available than at any time in the past. Yet ignorance of the differences between scientific and natural "truths" continues to cause tremendous anguish and suffering the world over. Virtually every issue of the SKEPTICAL INQUIRER features examples and consequences of this ignorance, which is not confined to the "unwashed masses." Paul Kurtz (1998, 48) notes, "Scientific illiteracy is widespread, even among the educated classes, and especially among politicians and the leaders of industry." And this observation applies even more strongly to awareness of the fundamental differences between religion, science, and the unholy (and unscientific) specter of

pseudoscience.

For a decade now, I have been teaching introductory-level courses in astronomy and physics that meet science requirements at a state liberal-arts college with no major in the physical sciences. Students interested in a natural science (our biology majors, for example) presumably do learn something about science and the scientific method by immersion (osmosis?)—though seldom in an explicit manner, I find—but they remain unaware of the foundations of scientific truth and of how these differ from those of religion. Nonscience majors leave the university with some exposure to the history of religious and philosophical thought and conflict, but with only a smattering of knowledge of the results (though not of the *methodology*) of science. In my experience, many in either group cannot even offer a clear explanation of the difference between science and technology! (Science, of course, is knowledge of the laws of nature; technology is the *application* of this knowledge to the manufacture of material products and devices.) I am sure that many educators—at all levels—share my frustration with this state of affairs, which is why I developed the following material. I make sure that *every* class I teach gets a dose of it to some extent.

SCIENCE	PSEUDOSCIENCE	RELIGION
• Truth from: SCIENTIFIC METHOD.	• Ad hoc mix of BOTH. Unproven, untested or disproven statements about nature taken on faith alone.	• Truth from: REVELATION.
• Same for all: OBJECTIVE.		• Differs by culture & interpretation: SUBJECTIVE.
• Can be done by anyone with the training.		• Only "given" to a select few.
• Truth is PROVISIONAL.		• Truth is ABSOLUTE.
• PROOF: OBSERVATION / EXPERIMENT.		• PROOF: none. Only need FAITH.
• Deals with: NATURAL WORLD.		• Deals with: SPIRITUALITY.

N.B. These are mutually exclusive. They deal with separate aspects of human existence.

Figure 1. Truth in science, religion, and pseudoscience.

Figure 1 illustrates the fact that science and religion are *mutually exclusive* and *complementary* aspects of human epistemology; that is, each deals with a separate domain of human experience. Science deals with the natural world, and religion with the spiritual world; as long as these are kept within their proper spheres of influence, it is obvious that no conflict can possibly exist! One can be both a scientist and, say, a Buddhist or a Moslem (or both, as a matter of fact, since all religious doctrines are mutually exclusive in principle; in *practice*, intolerance and hatred of other beliefs result from the sociopolitical manipulation of religion, and not from religion *per se*). Along with this, it is vitally important that students realize the roles of *proof* in both religion and science. In the former, proof has no meaning; it is replaced by faith. Either you believe (have faith), or you don't; this is the only legitimate "test" for a religion. For the latter, proof resides in putting the question to nature, i.e., in observation and experiment; faith doesn't enter into it, because a putative scientific truth (hypothesis) either passes the empirical tests or it doesn't. This point—that scientific truth is contingent upon an objective natural world and not upon subjective interpretation, and therefore lies on a different epistemological plane than does philosophical truth—seems to be as inscrutable to deconstructionists (and other postmodernist philosophers) as their opaque sophistry is to the rest of us.

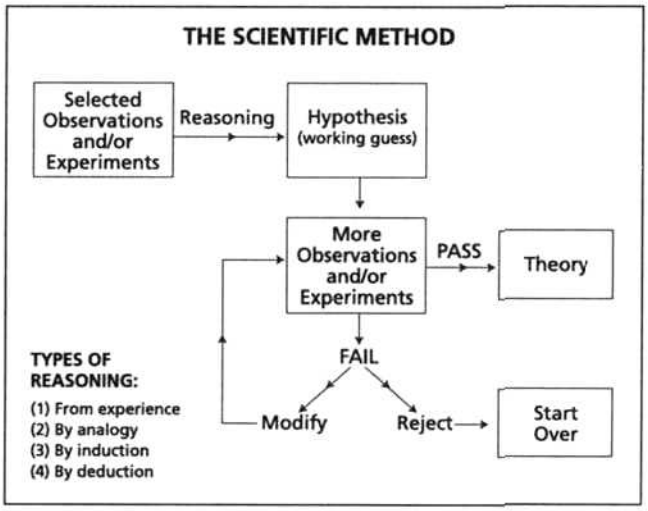

Figure 2. Schematic of the scientific method.

It is when someone attempts to mix scientific and religious principles, venturing into the toxic no-man's-land of pseudoscience, that the conflict—and the damage—ensues. Examples of this are legion: "Proof" that the accused is a witch; scholarly "analysis" of scriptures that "show" that one set of beliefs is superior to another and that only its adherents can attain salvation; "evidence" that ancient astronauts visited Earth, that the origin of species lies in contemporaneous divine creation, that one ethnic group is superior to another, that this herbal concoction or that crystal pendant cures cancer. Equally fatuous are "scientific" attempts to prove the existence of God, the continuity of spiritual existence after death, and so on. What these all have in common is an ill-defined and ever-changing blending of faith with selective (and usually fallacious) reasoning, whose proponents glibly switch between one and the other according to the argument with which they are confronted. Point-by-point juxtaposition of the underpinnings of

Zoran Pazameta teaches astronomy and physics in the Physical Sciences Department at Eastern Connecticut State University and is director of the university's planetarium. His research interests are astrophysics, cosmology, and the philosophy of science. Address: Physical Sciences Department, Eastern Connecticut State University, Willimantic, CT 06226.
E-mail: pazameta@ecsuc.ctstateu.edu.

religion and of science, as in figure 1, makes this very clear to the student.

Bringing up the matter of *religious* truth—how it is imparted by revelation to, and interpreted by, a select few (shamans, prophets, church officials, individual believers, and so on)—is an eye-opener for many students. Of course, those who are religious do resent mention of the fact that these revelations could be credited to dementia, use of psychoactive substances, or outright fraud as well as to divine inspiration; but the ultimate requirement for believers, one *by definition* both necessary and sufficient, remains faith.

Make mention, though, of the scientific method—the means by which *scientific* truth (see, for example, Estling 1998) is obtained—and you soon learn to expect eyes to glaze over. It's perceived as incomprehensible and somehow coldly alien. This is where the flowchart (figure 2) comes into play. Though it is by design self-explanatory, I augment it with discussion of the four kinds of reasoning (experience, analogy, induction, deduction) (Kline 1964, 24–27) and

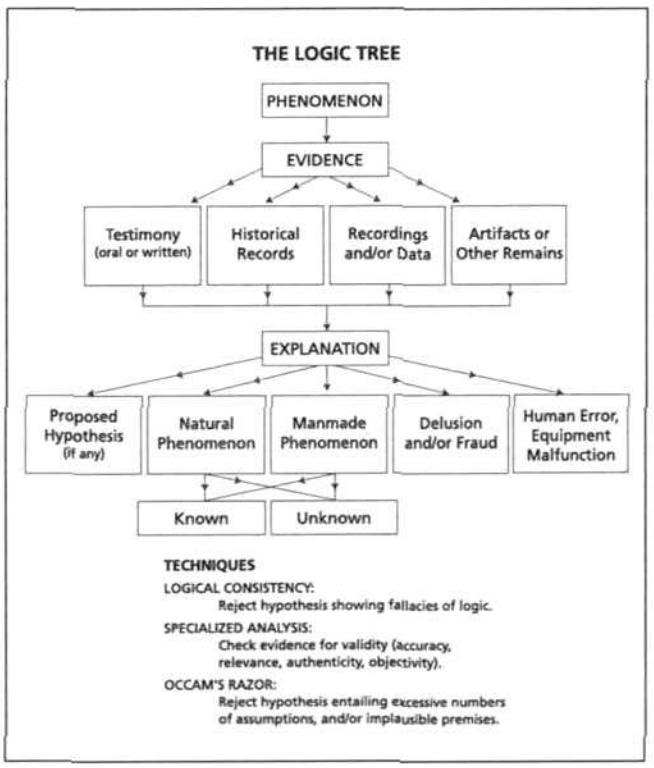

Figure 3: "Logic Tree" for analysis of arguments by elimination.

assign students the task of constructing examples of each. In addition, we cover the three criteria that *any* new hypothesis must satisfy to be accepted as a theory (Copi 1961, 426–433): It must explain one or more currently inexplicable phenomena (which is often the motivation for constructing the theory in the first place); it must incorporate the successful parts of the existing theory it proposes to replace (i.e., satisfy the Principle of Correspondence); and it must make predictions of new phenomena to be empirically tested. An example I often use is Einstein's theory of gravity: It explains the anomalous part of Mercury's orbital precession; it reduces to Newtonian gravity in the weak-field limit; it also successfully predicted the gravitational deflection of starlight passing near the Sun.

But it doesn't have to end here; we can go further. I have constructed what I call a Logic Tree (figure 3), which is a recipe for analyzing explanations of phenomena that involve some form of argument by elimination (Giere 1979, 147–153), as do most arguments labeled "paranormal." For example, in an application of this to the extraterrestrial visitation (ETV) hypothesis, after eliminating all other possibilities (not always possible to do beyond reasonable doubt), we see that we cannot choose between the ETV hypothesis and an (as yet) unknown natural phenomenon—both remain, at this stage, equally viable epistemologically. (Of course faith often tips the balance in favor of the hypothesis, but this entails stepping off the path of science and into a quagmire of logical fallacies and mutable *ad hoc* assumptions: Pseudoscience!) We may, however, apply Occam's Razor (and its skeptic concomitant, the stipulation that extraordinary claims require extraordinary proof) to deduce that it is *more plausible* that a given UFO phenomenon is of unknown but natural, rather than of artificial extraterrestrial, origin.

There are other topics that should, perhaps, be covered. Some of these I often touch on. Among them is the "interconnection factor," the fact that all sciences depend on each other to some extent (e.g., biomedical research using the technological fruits of the physics of optics and electronics), and that progress in one field cannot be accelerated by redirecting resources from another (in other words, science is not a zero-sum game). Related to this is the often overlooked fact that no amount of money or expertise directed toward a problem can *guarantee* a breakthrough in a given field within a given timeframe. With scientific research there are no answers in the back of the book, no ways of knowing a priori which areas of investigation will be fruitful and which will be dead ends. Moreover, we understand the basic science in some areas much more completely than in others—which answers the classic question of why we can send a man to the Moon, but cannot cure, say, cancer or AIDS.

In my experience, almost all of the above is new to the average college student, regardless of their chosen major. It is my hope that this material will strike a chord with other educators, and encourage them to criticize, expand, and refine this material as they present it to their students. As I see it, nothing less than the future of our civilization is at stake.

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Anthropic Design

Does the Cosmos Show Evidence of Purpose?

Claims that scientists have uncovered supernatural purpose to the universe have been widely reported recently in the media. The so-called anthropic coincidences, in which the constants of nature seem to be extraordinarily fine-tuned for the production of life, are taken as evidence. However, no such interpretation can be found in scientific literature. All we currently know from fundamental physics and cosmology remains consistent with a universe that evolved by purely natural processes.

VICTOR J. STENGER

Poking Out of the Noise

For about a decade now, an increasing number of scientists and theologians have been asserting, in popular articles and books, that they can detect a signal of cosmic purpose poking its head out of the noisy data of physics and cosmology (see, for example, Swinburne 1990; Ellis 1993; Ross 1995). This claim has been widely reported in the media (see, for example, Begley 1998; Easterbrook 1998), perhaps misleading laypeople into thinking that some kind of new scientific consensus is developing in support of supernatural beliefs. In fact, none of this purported evidence can be found in the pages of scientific journals, which continue to operate within a frame-

work in which all physical phenomena are assumed natural. As the argument goes, the data are said to reveal a universe that is exquisitely fine-tuned for the production of life. This precise balancing act is claimed to be too unlikely to be the result of mindless chance. An intelligent, purposeful, and indeed personal Creator must have made things the way they are.

As cosmologist and Quaker George Ellis explains it: "The symmetries and delicate balances we observe require an extraordinary coherence of conditions and cooperation of laws and effects, suggesting that in some sense they have been purposefully designed" (Ellis 1993, 97). Others have been less restrained in insisting that God is now *required* by the data and that this God must be the God of the Christian Bible (see, for example, Ross 1995).

The fine-tuning argument is based on the fact that life on Earth is very sensitive to the values of several fundamental physical constants. The tiniest change in any of these would result in changes so drastic that life as we know it would not exist. The delicate connections between physical constants and life are called the *anthropic coincidences* (Carter 1974; Barrow and Tipler 1986). The name is a misnomer. Human life is not singled out in any special way. At most, the coincidences show that the production of carbon and the other elements that make Earth's life possible required a sensitive balance of physical parameters.

For example, if the gravitational attraction between protons in stars had not been many orders of magnitude weaker than their electrical repulsion, stars would have collapsed long before nuclear processes could build up the chemical periodic table from the original hydrogen and deuterium. Furthermore, the element-synthesizing reactions in stars depend sensitively on the properties and abundances of deuterium and helium produced in the early universe. Deuterium would not exist if the neutron-proton mass difference were just slightly displaced from its actual value; neutrons, unstable in a free state, were stored in deuterium for their later use in building the elements.

The existing relative abundances of hydrogen and helium also implies a close balance of the relative strengths of the gravitational and weak nuclear forces. Given a slightly stronger weak force, the universe would be 100 percent hydrogen as all neutrons decayed away before assembling into deuterium and helium. A slightly weaker weak force and we would have a universe that is 100 percent helium; in that case neutrons would not have decayed and left the excess of protons that formed hydrogen. Neither of these extremes would have allowed for the existence of stars and life, as we know it, based on carbon chemistry. Barrow and Tipler (1986) list many other such "coincidences," some remarkable, others somewhat strained.

Interpreting the Coincidences

The interpretation of the anthropic coincidences in terms of purposeful design should be recognized as yet another variant of the ancient *argument from design* that has appeared in many different forms over the ages. The anthropic design

Brad Marshall

Victor J. Stenger is a professor of physics at the University of Hawaii. He is the author of Not By Design: The Origin of the Universe *(Prometheus Books, 1988),* Physics and Psychics: The Search for a World Beyond the Senses *(Prometheus Books, 1990), and* The Unconscious Quantum: Metaphysics in Modern Physics and Cosmology *(Prometheus Books, 1995).* *This is a much abridged version of a longer essay entitled* The Anthropic Coincidences: A Natural Explanation *to appear in the British* Skeptical Intelligencer.

argument asks: How can the universe possibly have obtained the unique set of physical constants it has, so exquisitely fine-tuned for life as they are, except by purposeful design—design with life and perhaps humanity in mind?

This argument, however, has at least one fatal flaw. It makes the wholly unwarranted assumption that *only one type of life is possible*—the particular form of carbon-based life we have here on Earth. Even if this is an unlikely result of chance, *some* form of life could still be a likely result. It is like arguing that a particular card hand is so improbable that it must have been preordained.

Based on recent studies in the sciences of complexity and "artificial life" computer simulations, sufficient complexity and long life appear to be primary conditions for a universe to contain some form of reproducing, evolving structures. This can happen with a wide range of physical parameters, as has been demonstrated (Stenger 1995). The fine-tuners have no basis in current knowledge for assuming that life is impossible except for a very narrow, improbable range of parameters.

Amusingly, the new cosmic creationists contradict the traditional design argument of the biological creationists, that the universe is so *uncongenial* to life that life could not have evolved naturally. The new creationists now tell us that the universe is so *congenial* to life that the universe could not have evolved naturally.

Since all scientific explanations until now have been natural, then it would seem that the first step, before asserting purposeful design, is to seek a natural explanation for the anthropic coincidences. Such a quest would avoid the invocation of supernatural agency until it is absolutely required by the data.

The Natural Scenario

For almost two decades, the *inflationary big bang* has been the standard model of cosmology (Guth 1981, 1997; Linde 1987, 1990, 1994). We keep hearing, again from the unreliable popular media, that the big bang theory is in trouble and the inflationary model is dead. In fact, no viable substitute has been proposed that has nearly the equivalent explanatory power.

The inflationary big bang offers a plausible, natural scenario for the uncaused origin and evolution of the universe, including the formation of order and structure—without the violation of any laws of physics. These laws themselves are now understood far more deeply than before, and we are beginning to grasp how they too could have come about naturally. The natural scenario I will describe here has not yet risen to the exalted status of a scientific theory. However, the fact that it is consistent will all current knowledge and cannot be ruled out at this time demonstrates that no rational basis exists for introducing the added hypothesis of supernatural creation. Such a hypothesis is simply not required by the data.

According to the proposed natural scenario, by means of a random quantum fluctuation the universe "tunneled" from pure vacuum ("nothing") to what is called a *false vacuum*, a region of space that contains no matter or radiation but is not quite nothing. The space inside a bubble of false vacuum is curved, or warped, and a small amount of energy is stored in that curvature, like the potential energy of a strung bow. This ostensible violation of energy conservation is allowed by the Heisenberg uncertainty principle for sufficiently small time intervals.

The bubble then inflated exponentially and the universe grew by many orders of magnitude in a tiny fraction of a second. (For a not-too-technical discussion and original references, see Stenger 1990.) As the bubble expanded, its curvature energy transformed (naturally) into matter and radiation. Inflation stopped, and the more linear big bang expansion we now experience commenced. As the universe cooled, its structure spontaneously froze out—just as formless water vapor freezes into snowflakes whose unique and complex patterns arise from a combination of symmetry and randomness.

In our universe, the first galaxies began to assemble after about a billion years, eventually evolving into stable systems where stars could live out their lives and populate the interstellar medium with the complex chemical elements, such as carbon, needed for the formation of life.

So how did our universe happen to be so "fine-tuned" as to produce wonderful, self-important carbon structures? As I explained above, we have no reason to assume that ours is the only possible form of life. Life of some sort could have happened regardless of the form the universe took—however the crystals on the arm of the snowflake happened to get arranged by chance.

If we have no reason to assume ours is the only life form, we also have no reason to assume that ours is the only universe. Many universes can exist, with all possible combinations of physical laws and constants. In that case, we just happen to be in the particular one that was suited for the evolution of our form of life. When cosmologists refer to the *anthropic principle*, this is all they usually mean. Since we live in this universe, we can assume it possesses qualities suitable for our existence. Humans evolved eyes sensitive to the region of electromagnetic spectrum from red to violet because the atmosphere is transparent in that range. Yet some would have us think that the causal action was the opposite, that the atmosphere of Earth was designed to be transparent from red to violet because human eyes are sensitive in that range. Stronger versions of the anthropic principle, which assert that the universe is somehow actually *required* to produce intelligent "information-processing systems" (Barrow and Tipler 1986), are not taken seriously by most scientists or philosophers.

The existence of many universes is consistent with all we know about physics and cosmology (Smith 1990; Smolin 1992, 1997; Linde 1994; Tegmark 1997). Some theologians and scientists dismiss the notion as a gross violation of Occam's razor (see, for example, Swinburne 1990). It is not. No new hypothesis is needed to consider multiple universes. In fact, it takes an added hypothesis to rule them out— a super law of nature that says only one universe can exist. But

we know of no such law, so we would violate Occam's razor to insist on only one universe. Another way to express this is with lines from T. H. White's *The Once and Future King*: "Everything not forbidden is compulsory."

The hundred billion galaxies of our visible universe, each with a hundred billion stars, is but a grain of sand on the Sahara that exists beyond our horizon, grown out of that single, original bubble of false vacuum. An endless number of such bubbles can very well exist, each itself nothing but a grain of sand on the Sahara of all existence. On such a Sahara, nothing is too improbable to have happened by chance.

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Science Is a Profound Source of Spirituality

In its encounter with Nature, science invariably elicits a sense of reverence and awe. The very act of understanding is a celebration of joining, merging, even if on a very modest scale, with the magnificence of the Cosmos. And the cumulative worldwide buildup of knowledge over time converts science into something only a little short of a transnational, transgenerational metamind.

"Spirit" comes from the Latin word "to breathe." What we breathe is air, which is certainly matter, however thin. Despite usage to the contrary, there is no necessary implication in the word "spiritual" that we are talking of anything other than matter (including the matter of which the brain is made), or anything outside the realm of science. On occasion, I will feel free to use the word. Science is not only compatible with spirituality; it is a profound source of spirituality. When we recognize our place in an immensity of light-years and in the passage of ages, when we grasp the intricacy, beauty, and subtlety of life, then that soaring feeling, that sense of elation and humility combined, is surely spiritual. So are our emotions in the presence of great art or music or literature, or of acts of exemplary selfless courage such as those of Mohandas Gandhi or Martin Luther King, Jr. The notion that science and spirituality are somehow mutually exclusive does a disservice to both.

—*Carl Sagan*, The Demon-Haunted World *(1995)*

Scientific Skepticism, CSICOP, and the Local Groups

Scientific skepticism defines skepticism around the principles of scientific investigation. Specifically, scientific skepticism addresses testable claims; untestable claims are simply outside the realm of science.

STEVEN NOVELLA and DAVID BLOOMBERG

The term *skepticism* has a number of meanings, which can sometimes lead to misunderstandings between those who use the word one way and those who interpret it another. Of particular interest, and frequently the focus of such misunderstandings, is the stance of skeptics and organized skepticism toward religion and faith. This article will address that issue by defining the term *skepticism* as it is used by most local skeptical organizations—at least in the view of the authors.

Let us first recall that this magazine is published by the Committee for the *Scientific* Investigation of Claims of the Paranormal. The word *scientific* is emphasized here with good reason—it is not the Committee for Philosophical

Discussions or the Committee for Religious Debates. The very name of this organization dedicates itself to scientific investigations. The local groups generally echo this viewpoint—often by stating directly that they are dedicated to the application of the scientific method to paranormal and fringe-science phenomena. We will use the term *scientific skeptics* to denote those who share this viewpoint.

There are others who believe that religion is a fair topic for skeptical analysis; we will use the term *rationalists* to denote these, because proponents of this view often promote the idea that atheism, or at least non-theism, and skepticism are both part of the same rationalist philosophy. Under this philosophy, a rationalist takes a materialistic, scientific approach to the world and renounces all superstition. There is no distinction between believing in leprechauns, alien abductions, ESP, reincarnation, or the existence of a god—each equally lacks objective evidence.

From this perspective, separating out the latter two beliefs and labeling them as religion—thereby exempting them from critical analysis—is intellectually dishonest. Rationalists often conclude that such behavior is motivated by a desire to avoid those superstitions that are most prominent in our particular culture out of fear of being excessively controversial. For one who promotes rationalism, the most widespread and sacredly guarded superstitions are the most important ones to oppose, for they have the greatest influence and can therefore do the most harm.

Scientific skepticism, however, defines skepticism more around the principles of scientific investigation than around the broader concept of rationalism. According to this view, there is a meaningful distinction between different kinds of beliefs. Specifically, scientific skepticism addresses testable claims, focusing on those that are controversial because they deal with the paranormal or the fringes of science, areas traditionally lacking adequate scientific rigor.

Untestable Claims

Claims that are not testable are simply outside the realm of science. A good example of this is the old creationist argument that God created the world to appear exactly as if it had evolved naturally over four billion years, fossils and all. This claim is certainly consistent with the evidence, but it makes no predictions that can be tested against future observations. In fact, it is designed to eliminate any observable distinction between an evolved and a created world. It is therefore important to identify such claims as untestable and therefore nonscientific because such claims are worthless to the advancement of knowledge. They cannot, by definition, be eliminated through evidence; therefore they must be banished to a realm outside of science.

What can a scientific skeptics' group say about such claims? Only that they are outside the realm of science, and that science can have only an agnostic view toward untestable hypotheses. A rationalist may argue that maintaining an arbitrary opinion about an untestable hypothesis is irrational—and he may be right. But this is a philosophical argument, not a scientific one. If an individual makes a personal choice to maintain a belief regarding an untestable hypothesis with no claims to evidence in support of that belief, then there is no scientific basis on which to challenge the belief. It is best labeled *faith*, which distinguishes it from a belief based on evidence.

The most obvious such belief is a person's answer to the question, "Does God exist?" There is simply no scientific way to know the answer to this. Certainly many people think they know the answer, and that is satisfying to them. Some have written entire books on why the universe does not need to have a god, but that does not prove that a god is nonexistent. Indeed, any omnipotent being worth his salt should be able to create a universe that doesn't have obvious inconsistencies in it.

The position of scientific skepticism is consistent, pragmatic, and allows the skeptical movement to precisely and confidently define the focus of its mission.

So that question comes down purely to faith. Either you believe in a god, or you don't. Science cannot answer that question.

Faith and Science

The real distinction made by scientific skepticism is not between religion and nonreligion, but between faith and science. A faith-based belief may be religious, New Age, paranormal, or even social. Testable religious claims, such as those of creationists, faith healers, and miracle men, however, are amenable to scientific skepticism. Therefore, anyone who claims to have scientific evidence for the existence of God has stepped into the scientific arena and is now open to skeptical criticism. These claims are part of the heart and soul (if you'll excuse the metaphor) of CSICOP and the local skeptics groups. But an individual professing a personal faith in God, who does not try to justify this faith with evidence, is immune to scientific arguments.

One criticism that has been leveled at this view is that we are merely trying to avoid offending people. Certainly, that is one part of it—but not for the reason that charge is leveled. Some rationalists have often assumed that all skeptics must be, like them, nontheists. As we've said, they often do not understand how one can be a skeptic and at the same time hold religious beliefs. Experiences in the local groups, however, show that one can indeed be a skeptic and still be religious. REALL, the Rational Examination Association of Lincoln Land, has

Steven Novella, M.D., is the president and co-founder of the New England Skeptical Society (NESS). David Bloomberg is the chairman and co-founder of the Rational Examination Association of Lincoln Land (REALL).

among its Patron members a retired reverend and a rabbinical school applicant (along with several outspoken atheists). Other local group leaders have similar examples; one even advertises its meetings in a church newsletter! So it certainly would offend those people to assume all skeptics to be nontheists. They are working to advance the same cause—the same way of thinking—as all the other skeptics are, so why should we push them away?

An argument often advanced against this position is that we do not accept others who hold beliefs contrary to our way of thinking, such as those who believe in astrology or creationism, so why should we treat these people with religious beliefs any differently? Because religious beliefs are beyond the scope of scientific inquiry, there is no more reason to discriminate against those with religious beliefs than there is to discriminate because of race, sexual preference, or political party. None of us would ever think of doing the latter, so why should anybody suggest the former?

Most of the local groups, including REALL and the New England Skeptical Society, officially profess the position of scientific skepticism. The compelling reason for this is that the definition of scientific skepticism provides a sound and internally consistent self-definition. Our roles are clearly defined—to defend science, to promote the scientific method as the best route to reliable knowledge about the universe, to challenge testable claims of a pseudoscientific, paranormal, or otherwise fringe nature, and to promote education, especially of science and critical thinking.

Without such a clearly defined focus, we risk being caught up in activities that may be only tangentially related to scientific skepticism. For example, the majority of our members probably oppose prayer in public schools, may support gay rights, and have strong feelings on abortion, but it is simply not the purpose of our organizations to expend our resources in such directions.

In addition, as a practical aspect to the focus on testable claims, our goal of teaching critical thinking and reason would be greatly hampered if we were perceived as being anti-religious. This single issue, which is not central to our purpose, could potentially drain our resources, monopolize our public image, and alienate many potential skeptics.

We should never be hesitant to scrutinize claims just because they have religious attachments—else we could not look at weeping icons, faith healers, Bible code finders, or fortunetellers who hang crosses in their windows. But systems of faith alone belong to the philosophers, not to the scientific skeptics like us.

The position of scientific skepticism is consistent, pragmatic, and allows the skeptical movement to precisely and confidently define the focus of its mission. Those who would prefer philosophical investigation have many other organizations to draw upon—including one that shares a headquarters building, and many members, with CSICOP. But CSICOP itself must stay true to its name and focus on *scientific* investigation. □

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For more information, contact Barry Karr, Executive Director of CSICOP, at **(716) 636-1425**. All inquiries are held in the strictest confidence.

Two Mind-Sets

Some concerns, questions, and critical thinking about religion and science.

STEVE ALLEN

There are some problems for which there's an actual solution. This is obviously the case in certain disciplines such as mathematics and other branches of science, as well as in daily life. This is also true for problems that have presented themselves in the history of medicine, for which specific cures were at last developed.

But there is another category of problems for which no such simple happy resolution is possible. And this is quite clearly the case for two distinct kinds of mind-sets through which we perceive and interpret the conditions of human life itself. The one is referred to, generally speaking, by the term *religious,* the other by the term *scientific.*

Fortunately there is not hopeless warfare between these

two categories on every actual or possible question. It is, after all, perfectly possible to hold to a great number of scientifically reasonable statements and yet to identify oneself as a member of one religious worldview or another. But ultimately there are questions in which the two opposing attitudes toward life cannot be so comfortably reconciled.

One of the first studies of such areas of conflict was Andrew White's *History of the Warfare Between Science and Theology,* published in the nineteenth century and still worthy of our attention.

To look on the brighter side, those forms of faith that continue to respect science are therefore capable of some degree of evolutionary progress. Witness the pope's apology a few years ago to Galileo. That apology was a long time coming, but it is, as I say, encouraging that it did in time take place.

But so much for personal niceness. The uncomfortable fact remains that for certain specific questions one cannot have a foot in both camps—at least without risking falling on one's face.

There are millions of Catholics, Jews, and Protestants who are perfectly aware that the age of the physical universe runs to billions of years. It is therefore impossible to maintain—unless one abandons sanity itself—that the universe is, in fact, only about 7,500 years old. But there are millions who do in fact believe it, who therefore totally turn their backs on the absolutely established scientific view. In this regard, they are much like the members of the Flat Earth Society who, despite having been shown mountains of evidence that we live on a large sphere, simply close their minds to that evidence and imagine that we live on some sort of enormous disc.

One public figure who holds to the view of a young Earth is the Reverend Pat Robertson, who has written a book in which he makes clear that he accepts the Genesis account of an entire universe made in six days, and also maintains that that particular construction project took place little more than 7,000 years ago. When Robertson is asked why he holds so obviously preposterous an opinion his reply is quite forthright. He points out that that is what the Bible arithmetic says. And he's certainly right about that.

I doubt very much that people like Pat Robertson were actually genetically endowed with a built-in weakness of the reasoning faculty. We are all familiar with that tragic question: "Why do bad things happen to good people?" We might also profitably spend some time wrestling with the question "How do otherwise bright people believe so many dumb things?"

Part of the explanation, I suspect, has to do with those two general divisions I mentioned earlier. Some people just seem to have a natural, healthy intelligent skepticism, often manifested by a simple request for evidence when presented with a pronouncement they find difficult to accept. Others, alas, far from being skeptical, seem governed by a strong tendency toward gullibility. It is safe to say that people in this latter category have clearly not been taught to think.

It's now something of a cliché to point out that our schools give us almost no critical-thinking instruction whatever. They teach us, sometimes quite effectively, what to think about but, to repeat the point, they rarely bother to advise us *how* to think well or wisely at all.

We make a serious mistake if we assume that anything accurately described by the modifier *religious* is automatically a reference to enemy territory. For example, in a recent issue of a little periodical called *The Joyful Noiseletter,* a collection of humor published by the Fellowship of Merry Christians, I found a cartoon in which a woman is speaking to the pastor of her church saying "According to my horoscope this is a good week to preach against false doctrines." In other words, it is not only the scientifically oriented who are convinced of the nonsensical nature of astrology. Christian churches, with few exceptions, are also among its critics. Why Ronald and Nancy Reagan believe in astrology is a separate question and, I suppose, none of my business.

Most people are made moderately uncomfortable criticizing religious beliefs or biases of people with whom they differ on certain relevant questions. While this sort of blunt discourse is acceptable in the context of formal debate, even the iconoclastic Mark Twain confessed that he was not entirely comfortable contradicting opinions on religion held by his wife. But such considerations need not long detain us because really everything known or knowable to humans is properly subject to responsible, reasonable analysis and criticism.

And those of the humanist or rationalist persuasions might be made more comfortable by knowing that however outspoken their own views on religious questions are, the fervor with which they are expressed is unlikely to equal that of religious believers themselves, who throughout history have shown their inclination to convey their religious views not only with fanatical certitude but in the form of violent and frequently murderous opposition. And the same long, tragic pattern is of course still present today. In India, for example, more than 20 million Catholics are at the moment in great danger from attacks by Hindus.

And nothing more complex than simple common sense tells us that every single founder of a new religion—and all of them were new at some point—has bothered to exercise his theological creativity only because of his deep dissatisfaction with other religions.

Now with regard to various goofy beliefs that are so alarmingly popular at present, some of them are related to religion. Occasionally this becomes quite clear, as in the case of the poor souls who committed suicide as a result of their hysterical reaction to the nonexistent spacecraft that they believed was somehow connected with the Hale-Bopp comet. The belief in ghosts is obviously based in religious thought. In this general connection I am often struck by how promptly many religious believers immediately throw overboard their dearest,

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Steve Allen, a CSICOP Fellow, is an author, entertainer, and the creator of The Tonight Show. *His book* Dumbth: The Lost Art of Thinking *has come out in a new edition by Prometheus Books (Amherst, N.Y.). Among his other books are* Meeting of the Minds, Reflections, *and* Steve Allen on the Bible, Religion, and Morality. *This article is based on a talk he gave at the CSICOP Council for Media Integrity conference "That's Entertainment: Hollywood, the Media, and the Supernatural" in Los Angeles in November 1998.*

lifelong beliefs if some rival and contradictory superstition catches their fancy.

With regard to ghosts, for example—assuming we define them as the spirits of humans who were once living—the churches have for centuries taught that we had a very limited number of options regarding our fate the moment after death. One was that we would be immediately ushered into God's presence in an imprecisely located place called heaven.

Item B on this particular list was if you had lived an evil and destructive life for a good part of your time on Earth you would immediately be plunged into a state called hell. And we may legitimately refer to it as a place rather than a state because the vast majority of believers are quite confident that the dominant physical characteristic of hell is its endless roaring flames. This leads to a number of questions so far never satisfactorily answered, such as what harm physical flame could actually do to a disembodied spirit.

The third state—not believed in by as many people as the first two—is that since very few of us have lived morally perfect lives, even if our ultimate destination is heaven we must spend some indeterminate period being purified by intense sufferings in a place called purgatory, where—as we see by looking at the root of the word—we will, by some unexplained process, be *purged* of our sins, or at least punished for them.

Now these three options, as I say, were all that the churches have long had to propose for what happens to us after the moment of death. With the advent of Freethought a fourth option—total nonexistence—was introduced, but of course it had no appeal for true believers.

But now consider what sort of stories are invariably introduced by those who claim either that they personally have seen a ghost or they know some trustworthy person who asserts that he has. If I were to see someone—or something—that identified itself as a ghost, my very first question would be, "What are you doing here in Cleveland in this garage? I thought you were supposed to be in heaven, hell, or purgatory."

Now that happens to be an entirely reasonable question, and if the ghost insists that it has every right—or at least some reason—for its presence on top of Mount Everest, in a Las Vegas gambling casino, or whatever other unlikely place he might be encountered, we should ask him how his presence can be accommodated within the context of traditional religious beliefs about post-death experience. (For whatever reasons, I have been in the habit of asking such questions since early childhood, at which time I was not only a believer but quite a devout little one.)

It might be argued that belief that aliens have landed—from God knows where, and are in fact living among us as present—does *not* have a religious connection, but I suggest that it does, insofar as I have never heard of an agnostic, reputable scientist, rationalist, or secular humanist who claimed to have personally experienced abduction or witnessed a crash of some metallic object in an Iowa corn field from which seventeen little purple creatures were clearly visible scurrying away into the nearby woods. I have the impression that all of those who do issue such reports are a priori religious believers. □

Aren't Scientific Beliefs Based on Faith As Well?

"Usually 'faith' refers to beliefs that are accepted without empirical evidence. Most religions have tenets of faith. Science differs from religion because it is the nature of science to test and retest explanations against the natural world. Thus scientific explanations are likely to be built on and modified with new information and new ways of looking at old information. This is quite different from most religious beliefs.

"Therefore, 'belief' is not really an appropriate term to use in science, because testing is such an important part of this way of knowing. If there is a component of faith to science, it is the assumption that the universe operates according to regularities — for example, that the speed of light will not change tomorrow. Even the assumption of that regularity is tested — and thus far has held up well. This 'faith' is very different from religious faith.

"Science is a way of knowing about the natural world. It is limited to explaining the natural world through natural causes. Science can say nothing about the supernatural. Whether God exists or not is a question about which science is neutral."

—*Teaching About Evolution and the Nature of Science*, National Academy of Sciences, Washington, D.C., 1997

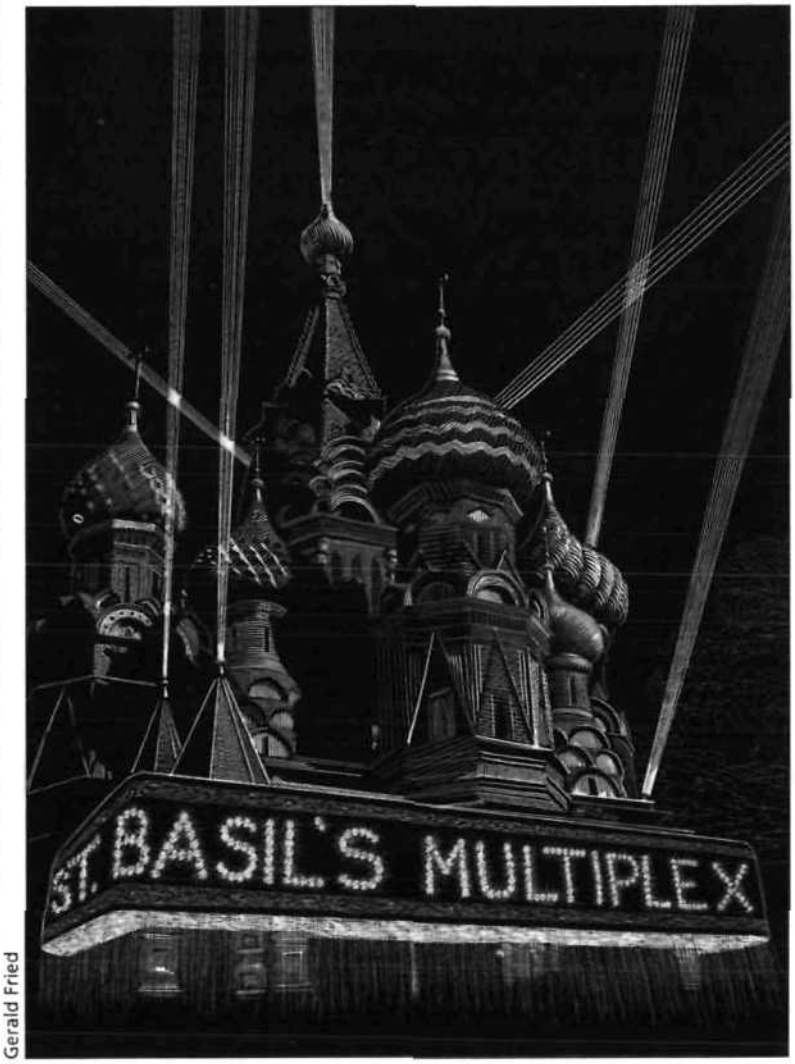
God Is Dead, After Weather and Sports

MIKE REISS

Late in the millennium, astrophysicists perfected the Grand Unified Field Theory, found the last scraps of "missing matter" in the universe, and proved, quite by accident, that God does not exist. Or, at best, God was not a very awesome particle, one billion-billion-billionth the size of a pea, with the static electricity charge of an infinitely small sock stuck to a tiny sweater. The media reported this story with the same breathless style they used in "Salt is a Killer" in 1991 and "Salt is a Miracle Cure" in 1998. And the public reacted to reports of God's non-existence as it had to such shocking stories as Darwin's theory of evolution or Michael Jackson's pederasty:

> Day 1: That can't possibly be true.
> Day 2: I kind of knew it all along.

The jig was up for religious leaders all over the world, and many decided to come clean. From Britain, the long-suppressed introduction to the King James Bible was released: "This is a booke of instructional tayles for children and the *weak of minde, and not to be taken too seriously.*" Israeli archaeologists confessed that the Dead Sea Scrolls were a rather crude forgery which contained such glaring anachronisms as "toothpaste," "steam engine," and "Phil Silvers." And Chinese scholars admitted that the chubby smiling Buddha began life as a corporate logo for pickled eel in the third century; he was, in effect, the Bob's Big Boy of his time.



Gerald Fried

And so the world began to accept life without God. Christians who had been searching for an excuse to skip *church now had a* humdinger. Jews could finally eat pork without guilt, and found it didn't taste nearly as good that way. Contrarily, millions of starving Hindus were quite happy to eat the sacred cows which had sauntered through their streets for centuries. By year's end, India's leading killer had gone from hunger to hypertension, and the cliché of the portly, red-faced Hindu *was born.*

All but the most fun religious holidays soon passed into obscurity. Easter: in. Lent: out. Hanukkah stayed, while Yom Kippur was replaced with Hanukkah II. Ramadan, the Moslem period of fasting, sobriety, and sexual abstinence, was shortened from twenty-eight days to twenty-eight seconds. Christmas, which had long ago been stripped of any religious meaning, was virtually unchanged.

All over the world, houses of worship lost their tax-exempt status and were forced to shut down. Mosques became banks, cathedrals were converted into multiplexes. Dozens of small churches were turned into a chain of coffee shops called "St. Arbucks." They were wildly successful in 2003, and bankrupt a year later.

In 2008, the Catholic Church had a massive going out of business sale, auctioning off all its religious art. The Last *Supper now graces the lobby of Mitsubishi International in* Osaka. The Sistine Chapel ceiling was moved intact to Trump's Vaticasino in Atlantic City; cigarette smoke has undone all the restoration work and it now looks worse than ever. Larry Flynt bought the Pieta, and what he's done with it is too gruesome to speculate on.

The Vatican, now stripped of its treasures, installed a water slide to attract tourists. It didn't work. As for the Pope, he became just another celebrity, famous for being famous. He had a talk show on the USA Network, he did a brandy ad, he cut a country and western album. His infomercial for a vibrating massage chair can be seen on many cable channels at three A.M. He married Linda Evans.

One thing did *not* happen in the post-*God world: there was* not a total moral collapse. People who didn't have sex because they were too religious now didn't have sex because they were too ugly. A Dallas man who didn't kill his hated wife out of fear of God, now didn't kill her out of fear of the Texas Department of Corrections. In fact, he never killed her—they remained married for fifty-eight years. In the last six years of his life, the man grew demented and began to think his wife was his mother; he died more in love with her than he could possibly imagine.

And so the Godless world plugged along—people were lustier, greedier, prouder, angrier, more envious, gluttonous, and slothful—but not so much you'd notice. They were also a *little happier, until July 18, 2036, when geologists taking deep* core samples discovered there really *was* a Hell and we were all going there. □

Mike Reiss co-conceived and produced The Simpsons *television episode "The Springfield Files"* (The Simpsons meet the X-Files) *described in the September/October 1997* SKEPTICAL INQUIRER. *He lives in Los Angeles.*

Some Earlier Discussions of Science and Religion in SI

Articles/Columns:

G.A. Clark, "NAGPRA, Science, and the Demon-Haunted World," May/June 1999
Gerald LaRue, "The Bible and the Prophets of Doom," January/February 1999
Martin Gardner, "Science and the Unknowable," November/December 1998
David A. Shotwell, "From the Anthropic Principle to the Supernatural," November/December 1998
Joe Nickell, "Science vs 'Shroud Science'," July/August 1998
Ralph Estling, "Gimme That Ol'-Time Logical Consistency," May/June 1998
Kendrick Frazier, "A Mind at Play: An Interview with Martin Gardner," March/April 1998
Ralph Estling, "Why the World Is Not My Idea . . . or George's," March/April 1998
Joe Nickell, "Jesus Among the Clouds," January/February 1998
Martin Gardner, "Intelligent Design and Phillip Johnson," November/December 1997
David E. Thomas, "Hidden Messages and the Bible Code," November/December 1997, and "Bible-Code Developments," March/April 1998
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Special Section on Heaven's Gate Cult Suicides. Articles by Paul Kurtz, Martin Gardner, Joe Nickell, Thomas R. Casten, and Tom Genoni Jr., July/August 1997
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Reviews:

Edward J. Larson's *Summer for the Gods: The Scopes Trial and America's Continuing Debate Over Science and Religion*, July/August 1998
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Vine Deloria Jr.'s *Red Earth, White Lies*, January/February 1997

News & Comment:

"National Academy of Sciences: Evolution Must be Taught If Students Are to Understand Modern Biology," July/August 1998
"Religious Belief Among Scientists Stable for Eighty Years," September/October 1997
"'Miracle' Priest Suspended," September/October 1997
"Pope's Affirmation of Evolution Welcomed by Scientists, Educators," January/February 1997
"Creation Science Banned from Lakewood, Ohio, Classrooms," January/February 1997
"Image of Guadalupe Myth-perception," January/February 1997

Conference Report:

"Medical School Faith Healing: Report on a Spirituality Conference" (Bryant Furlow), September/October 1997

Letters to the Editor:

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"Medical School Spirituality Conference," January/February 1998

Whence Religious Belief?

Religious concepts are human concepts with a few emendations that make them wondrous and a longer list of standard traits that seemingly make them sensible to our ordinary ways of knowing.

STEVEN PINKER

"The most common of all follies," wrote H. L. Mencken, "is to believe passionately in the palpably not true. It is the chief occupation of mankind." In culture after culture, people believe that the soul lives on after death, that rituals can change the physical world and divine the truth, and that illness and misfortune are caused and alleviated by spirits, ghosts, saints, fairies, angels, demons, cherubim, djinns, devils, and gods. According to polls, more than a quarter of today's Americans believe in witches, almost half believe in ghosts, half believe in the devil, half believe that the book of Genesis is literally true, sixty-nine percent believe in angels, eighty-seven percent believe that Jesus was raised from the dead, and ninety-

six percent believe in a God or universal spirit.

How does religion fit into a mind that one might have thought was designed to reject the palpably not true? The common answer—that people take comfort in the thought of a benevolent shepherd, a universal plan, or an afterlife—is unsatisfying, because it only raises the question of *why* a mind would evolve to find comfort in beliefs it can plainly see are false. A freezing person finds no comfort in believing he is warm; a person face-to-face with a lion is not put at ease by the conviction that it is a rabbit.

What is religion? The psychology of religion has been muddied by scholars' attempts to exalt it while understanding it. Religion cannot be equated with our higher, spiritual, humane, ethical yearnings (though it sometimes overlaps with them). The Bible contains instructions for genocide, rape, and the destruction of families, and even the Ten Commandments, read in context, prohibit murder, lying, and theft only within the tribe, not against outsiders. Religions have given us stonings, witch-burnings, crusades, inquisitions, jihads, fatwas, suicide bombers, abortion-clinic gunmen, and mothers who drown their sons so they can be happily reunited in heaven. As Blaise Pascal wrote, "Men never do evil so completely and cheerfully as when they do it from religious conviction."

Religion is not a single topic. What we call religion in the modern West is an alternative culture of laws and customs that survived alongside those of the nation-state because of accidents of European history. Religions, like other cultures, have produced great art, philosophy, and law, but their customs, like those of other cultures, often serve the interests of the people who promulgate them. Ancestor worship must be an appealing idea to people who are about to become ancestors. As one's days dwindle, life begins to shift from an iterative prisoner's dilemma, in which defection can be punished and cooperation rewarded, to a one-shot prisoner's dilemma, in which enforcement is impossible. If you can convince your children that your soul will live on and watch over their affairs, they are less emboldened to defect while you are alive. Food taboos keep members of the tribe from becoming intimate with outsiders. Rites of passage demarcate the people who are entitled to the privileges of social categories (fetus or family member, child or adult, single or married) so as to preempt endless haggling over gray areas. Painful initiations weed out anyone who wants the benefits of membership without being committed to paying the costs. Witches are often mothers-in-law and other inconvenient people. Shamans and priests are Wizards of Oz who use special effects, from sleight-of-hand and ventriloquism to sumptuous temples and cathedrals, to convince others that they are privy to forces of power and wonder.

Let's focus on the truly distinctive part of the psychology of religion. The anthropologist Ruth Benedict first pointed out the common thread of religious practice in all cultures: religion is a technique for success. Ambrose Bierce defined *to pray* as "to ask that the laws of the universe be annulled on behalf of a single petitioner confessedly unworthy." People everywhere beseech gods and spirits for recovery from illness, for success in love or on the battlefield, and for good weather. Religion is a desperate measure that people resort to when the stakes are high and they have exhausted the usual techniques for the causation of success—medicines, strategies, courtship, and, in the case of the weather, nothing.

What kind of mind would do something as useless as inventing ghosts and bribing them for good weather? How does that fit into the idea that reasoning comes from a system of modules designed to figure out how the world works? The anthropologists Pascal Boyer and Dan Sperber have shown that it fits rather well. First, nonliterate peoples are not psychotic hallucinators who are unable to distinguish fantasy from reality. They know there is a humdrum world of people and objects driven by the usual laws, and find the ghosts and spirits of their belief system to be terrifying and fascinating precisely *because* they violate their own ordinary intuitions about the world.

Second, the spirits, talismans, seers, and other sacred entities are never invented out of whole cloth. People take a construct from one of the cognitive modules—an object, person, animal, natural substance, or artifact—and cross out a property or write in a new one, letting the construct keep the rest of its standard-issue traits. A tool or weapon or substance will be granted some extra causal power but otherwise is expected to behave as it did before. It lives at one place at one time, is unable to pass through solid objects, and so on. A spirit is stipulated to be exempt from one or more of the laws of biology (growing, aging, dying), physics (solidity, visibility, causation by contact), or psychology (thoughts and desires are known only through behavior). But otherwise the spirit is recognizable as a kind of person or animal. Spirits see and hear, have a memory, have beliefs and desires, act on conditions that they believe will bring about a desired effect, make decisions, and issue threats and bargains. When the elders spread religious beliefs, they never bother to spell out these defaults. No one ever says, "If the spirits promise us good weather in exchange for a sacrifice, and they know we want good weather, they predict that we will make the sacrifice." They don't have to, because they know that the minds of the pupils will automatically supply these beliefs from their tacit knowledge of psychology. Believers also avoid working out the strange logical consequences of these piecemeal revisions of ordinary things.

WHENCE RELIGIOUS BELIEF?

Continued on page 80

Steven Pinker is a professor of psychology and director of the Center for Cognitive Neuroscience at the Massachusetts Institute of Technology. He is author of The Language Instinct *and* How the Mind Works *(W.W. Norton 1997), from which this article is excerpted. He is a CSICOP Scientific Consultant.*

Non-Overlapping Magisteria

No supposed 'conflict' between science and religion should exist because each subject has a legitimate magisterium, or domain of teaching authority—and these magisteria do not overlap (nor do they encompass all inquiry). But the two magisteria bump right up against each other, interdigitating in wondrously complex ways along their joint border.

STEPHEN JAY GOULD

Incongruous places often inspire anomalous stories. In early 1984, I spent several nights at the Vatican housed in a hotel built for itinerant priests. While pondering over such puzzling issues as the intended function of the bidet in each bathroom, and hungering for something more than plum jam on my breakfast rolls (why did the basket only contain hundreds of identical plum packets and not a one of, say, strawberry?), I encountered yet another among the innumerable issues of contrasting cultures that can make life so expansive and interesting. Our crowd (present in Rome to attend a meeting on nuclear winter, sponsored by the Pontifical Academy of Sciences) shared the hotel with a group of French and Italian Jesuit priests who were also pro-

fessional scientists. One day at lunch, the priests called me over to their table to pose a problem that kind been troubling them. What, they wanted to know, was going on in America with all this talk about "scientific creationism"? One of the priests asked me: "Is evolution really in some kind of trouble; and, if so, what could such trouble be? I have always been taught that no doctrinal conflict exists between evolution and Catholic faith, and the evidence for evolution seems both utterly satisfying and entirely overwhelming. Have I missed something?"

I certainly felt bemused by the anomaly of trying to reassure a group of priests that evolution remained both true and entirely consistent with religious belief.

A lively pastiche of French, Italian, and English conversation then ensued for half an hour or so, but the priests all seemed reassured by my general answer—"Evolution has encountered no intellectual trouble; no new arguments have been offered. Creationism is a home-grown phenomenon of American sociocultural history—a splinter movement (unfortunately rather more of a beam these days) of Protestant fundamentalists who believe that every word of the Bible must be literally true, whatever such a claim might mean." We all left satisfied, but I certainly felt bemused by the anomaly of my role as a Jewish agnostic, trying to reassure a group of priests that evolution remained both true and entirely consistent with religious belief.

Another story in the same mold: I am often asked whether I ever encounter creationism as a live issue among my Harvard undergraduate students. I reply that only once, in thirty years of teaching, did I experience such an incident. A very sincere and serious freshman student came to my office with a question that had clearly been troubling him deeply. He said to me, "I am a devout Christian and have never had any reason to doubt evolution, an idea that seems both exciting and well documented. But my roommate, a proselytizing evangelical, has been insisting with enormous vigor that I cannot be both a real Christian and an evolutionist. So tell me, can a person believe both in God and in evolution?" Again, I gulped hard, did my intellectual duty, and reassured him that evolution was both true and entirely compatible with Christian belief—a position that I hold sincerely, but still an odd situation for a Jewish agnostic.

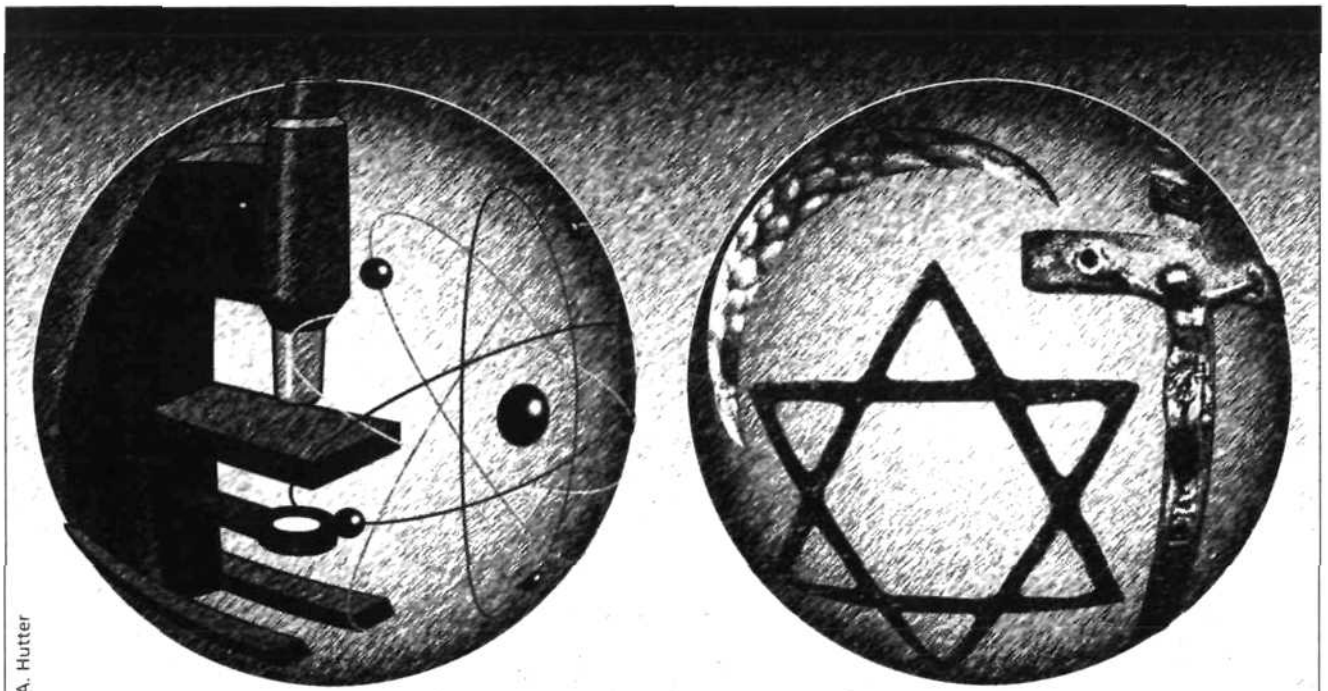
These two stories illustrate a cardinal point, frequently unrecognized but absolutely central to any understanding of the status and impact of the politically potent, fundamentalist doctrine known by its self-proclaimed oxymoron as "scientific creationism"—the claim that the Bible is literally true, that all organisms were created during six days of twenty-four hours, that the earth is only a few thousand years old, and that evolution must therefore be false. Creationism does not pit science against religion (as my opening stories indicate), for no such conflict exists. Creationism does not raise any unsettled intellectual issues about the nature of biology or the history of life. Creationism is a local and parochial movement, powerful only in the United States among Western nations, and prevalent only among the few sectors of American Protestantism that choose to read the Bible as an inerrant document, literally true in every jot and tittle.

I do not doubt that one could find an occasional nun who would prefer to teach creationism in her parochial school biology class, or an occasional rabbi who does the same in his yeshiva, but creationism based on biblical literalism makes little sense either to Catholics or Jews, for neither religion maintains any extensive tradition for reading the Bible as literal truth, other than illuminating literature based partly on metaphor and allegory (essential components of all good writing), and demanding interpretation for proper understanding. Most Protestant groups, of course, take the same position—the fundamentalist fringe notwithstanding.

The argument that I have just outlined by personal stories and general statements represents the standard attitude of all major Western religions (and of Western science) today. (I cannot, through ignorance, speak of Eastern religions, though I suspect that the same position would prevail in most cases.) The *lack of conflict* between science and religion arises from a *lack of overlap* between their respective domains of professional expertise—science in the empirical constitution of the universe, and religion in the search for proper ethical values and the spiritual meaning of our lives. The attainment of wisdom in a full life requires extensive attention to both domains—for a great book tells us both that the truth can make us free, and that we will live in optimal harmony with our fellows when we learn to do justly, love mercy, and walk humbly.

In the context of this "standard" position, I was enormously puzzled by a statement issued by Pope John Paul II on October 22, 1996, to the Pontifical Academy of Sciences, the same body that had sponsored my earlier trip to the Vatican. In this document, titled "Truth Cannot Contradict Truth," the Pope defended both the evidence for evolution and the consistency of the theory with Catholic religious doctrine. Newspapers throughout the world responded with front-page headlines, as

Stephen Jay Gould, a CSICOP Fellow, is the Alexander Agassiz professor of zoology and professor of geology at Harvard University. His latest book, Rocks of Ages: Science and Religion in the Fullness of Life, *elaborates on the theme in this article, which was published in his book* Leonardo's Mountain of Clams and the Diet of Worms.



Lisa A. Hutter

in *The New York Times* for October 25: "Pope Bolsters Church's Support for Scientific View of Evolution."

Now I know about "slow news days," and I do allow that nothing else was strongly competing for headlines at that particular moment. Still, I couldn't help feeling immensely puzzled by all the attention paid to the Pope's statement (while being wryly pleased, of course, for we need all the good press we can get, especially from respected outside sources). The Catholic Church does not oppose evolution, and has no reason to do so. Why had the Pope issued such a statement at all? And why had the press responded with an orgy of worldwide front-page coverage?

I could only conclude at first, and wrongly as I soon learned, that journalists throughout the world must deeply misunderstand the relationship between science and religion, and must therefore be elevating a minor papal comment to unwarranted notice. Perhaps most people really do think that a war exists between science and religion, and that evolution cannot be squared with a belief in God. In such a context, a papal admission of evolution's legitimate status might be regarded as major news indeed—a sort of modern equivalent for a story that never happened, but would have made the biggest journalistic splash of 1640: Pope Urban VIII releases his most famous prisoner from house arrest and humbly apologizes: "Sorry, Signor Galileo . . . the sun, er, is central."

But I then discovered that such prominent coverage of papal satisfaction with evolution had not been an error of non-Catholic anglophone journalists. The Vatican itself had issued the statement as a major news release. And Italian newspapers had featured, if anything, even bigger headlines and longer stories. The conservative *Il Giornale*, for example, shouted from its masthead: "Pope Says We May Descend from Monkeys."

Clearly, I was out to lunch; something novel or surprising must lurk within the papal statement, but what could be causing all the fuss?—especially given the accuracy of my primary impression (as I later verified) that the Catholic Church values scientific study, views science as no threat to religion in general or Catholic doctrine in particular, and has long accepted both the legitimacy of evolution as a field of study and the potential harmony of evolutionary conclusions with Catholic faith.

As a former constituent of Tip O'Neill, I certainly know that "all politics is local"—and that the Vatican undoubtedly has its own internal reasons, quite opaque to me, for announcing papal support of evolution in a major statement. Still, I reasoned that I must be missing some important key, and I felt quite frustrated. I then remembered the primary rule of intellectual life: When puzzled, it never hurts to read the primary documents—a rather simple and self-evident principle that has, nonetheless, completely disappeared from large sectors of the American experience.

I knew that Pope Pius XII (not one of my favorite figures in twentieth-century history, to say the least) had made the primary statement in a 1950 encyclical entitled *Humani Generis*. *I knew the main thrust of his message:* Catholics could believe whatever science determined about the evolution of the human body, so long as they accepted that, at some time of his choosing, God had infused the soul into such a creature.

I also knew that I had no problem with this argument—for, whatever my private beliefs about souls, science cannot touch such a subject and therefore cannot be threatened by any theological position on such a legitimately and intrinsically religious issue. Pope Pius XII, in other words, had properly acknowledged and respected the separate domains of science and theology. Thus, I found myself in total agreement with *Humani Generis*—but I had never read the document in full (not much of an impediment to stating an opinion these days).

I quickly got the relevant writings from, of all places, the Internet. (The Pope is prominently on line, but a luddite like me is not. So I got a cyberwise associate to dredge up the documents. I do love the fracture of stereotypes implied by finding religion so hep and a scientist so square.) Having now read in full both Pope Pius's *Humani Generis* of 1950 and Pope John Paul's proclamation of October 1996, I finally understand why the recent statement seems so new, revealing, and worthy of all those headlines. And the message could not be more welcome for evolutionists, and friends of both science and religion.

No conflict should exist because each subject has a legitimate magisterium, or domain of teaching authority—and these magisteria do not overlap.

The text of *Humani Generis* focuses on the *Magisterium* (or Teaching Authority) of the Church—a word derived not from any concept of majesty or unquestionable awe, but from the different notion of teaching, for *magister* means "teacher" in Latin. We may, I think, adopt this word and concept to express the central point of this essay and the principled resolution of supposed "conflict" or "warfare" between science and religion. No such conflict should exist because each subject has a legitimate magisterium, or domain of teaching authority—and these magisteria do not overlap (the principle that I would like to designate as NOMA, or "nonoverlapping magisteria"). The net of science covers the empirical realm: what is the universe made of (fact) and why does it work this way (theory). The net of religion extends over questions of moral meaning and value. These two magisteria do not overlap, nor do they encompass all inquiry (consider, for starters, the magisterium of art and the meaning of beauty). To cite the usual clichés, we get the age of rocks, and religion retains the rock of ages; we study how the heavens go, and they determine how to go to heaven.

This resolution might remain entirely neat and clean if the non-overlapping magisteria of science and religion stood far apart, separated by an extensive no-man's-land. But, in fact, the two magisteria bump right up against each other, interdigitating in wondrously complex ways along their joint border. Many of our deepest questions call upon aspects of both magisteria for different parts of a full answer—and the sorting of legitimate domains can become quite complex and difficult. To cite just two broad questions involving both evolutionary facts and moral arguments: Since evolution made us the only earthly creatures with advanced consciousness, what responsibilities are so entailed for our relations with other species? What do our genealogical ties with other organisms imply about the meaning of human life?

Pius XII's *Humani Generis* (1950), a highly traditionalist document written by a deeply conservative man, faces all the "isms" and cynicisms that rode the wake of World War II and informed the struggle to rebuild human decency from the ashes of the Holocaust. The encyclical bears the subtitle "concerning some false opinions which threaten to undermine the foundations of Catholic doctrine," and begins with a statement of embattlement:

> Disagreement and error among men on moral and religious matters have always been a cause of profound sorrow to all good men, but above all to the true and loyal sons of the Church, especially today, when we see the principles of Christian culture being attacked on all sides.

Pius lashes out, in turn, at various external enemies of the Church: pantheism, existentialism, dialectical materialism, historicism, and, of course and preeminently, communism. He then notes with sadness that some well-meaning folks within the Church have fallen into a dangerous relativism—"a theological pacifism and egalitarianism, in which all points of view become equally valid"—in order to include those who yearn for the embrace of Christian religion, but do not wish to accept the particularly Catholic magisterium.

Speaking as a conservative's conservative, Pius laments:

> Novelties of this kind have already borne their deadly fruit in almost all branches of theology. . . . Some question whether angels are personal beings, and whether matter and spirit differ essentially. . . . Some even say that the doctrine of Transubstantiation, based on an antiquated philosophic notion of substance, should be so modified that the Real Presence of Christ in the Holy Eucharist be reduced to a kind of symbolism.

Pius first mentions evolution to decry a misuse by overextension among zealous supporters of the anathematized "isms":

> Some imprudently and indiscreetly hold that evolution . . . explains the origin of all things. . . . Communists gladly subscribe to this opinion so that, when the souls of men have been deprived of every idea of a personal God, they may the more efficaciously defend and propagate their dialectical materialism.

Pius presents his major statement on evolution near the end of the encyclical, in paragraphs 35 through 37. He accepts the standard model of non-overlapping magisteria (NOMA) and begins by acknowledging that evolution lies in a difficult area

where the domains press hard against each other. "It remains for Us now to speak about those questions which, although they pertain to the positive sciences, are nevertheless more or less connected with the truths of the Christian faith."[1]

Pius then writes the well-known words that permit Catholics to entertain the evolution of the human body (a factual issue under the magisterium of science), so long as they accept the divine creation and infusion of the soul (a theological notion under the magisterium of religion).

> The Teaching Authority of the Church does not forbid that, in conformity with the present state of human sciences and sacred theology, research and discussions, on the part of men experienced in both fields, take place with regard to the doctrine of evolution, in as far as it inquires into the origin of the human body as coming from pre-existent and living matter—for the Catholic faith obliges us to hold that souls are immediately created by God.

I had, up to here, found nothing surprising in *Humani Generis*, and nothing to relieve my puzzlement about the novelty of Pope John Paul's recent statement. But I read further and realized that Pius had said more about evolution, something I had never seen quoted, and something that made John Paul's statement most interesting indeed. In short, Pius forcefully proclaimed that while evolution may be legitimate in principle, the theory, in fact, had not been proven and might well be entirely wrong. One gets the strong impression, moreover, that Pius was rooting pretty hard for a verdict of falsity.

Continuing directly from the last quotation, Pius advises us about the proper study of evolution:

> However, this must be done in such a way that the reasons for both opinions, that is, those favorable and those unfavorable to evolution, be weighed and judged with the necessary seriousness, moderation and measure. . . . Some however, rashly transgress this liberty of discussion, when they act as if the origin of the human body from preexisting and living matter were already completely certain and proved by the facts which have been discovered up to now and by reasoning on those facts, and as if there were nothing in the sources of divine revelation which demands the greatest moderation and caution in this question.

To summarize, Pius generally accepts the NOMA principle of nonoverlapping magisteria in permitting Catholics to entertain the hypothesis of evolution for the human body so long as they accept the divine infusion of the soul. But he then offers some (holy) fatherly advice to scientists about the status of evolution as a scientific concept: the idea is not yet proven, and you all need to be especially cautious because evolution raises many troubling issues right on the border of my magisterium. One may read this second theme in two rather different ways: either as a gratuitous incursion into a different magisterium, or as a helpful perspective from an intelligent and concerned outsider. As a man of goodwill, and in the interest of conciliation, I am content to embrace the latter reading.

In any case, this rarely quoted second claim (that evolution remains both unproven and a bit dangerous)—and not the familiar first argument for the NOMA principle (that Catholics may accept the evolution of the body so long as they embrace the creation of the soul)—defines the novelty and the interest of John Paul's recent statement.

John Paul begins by summarizing Pius's older encyclical of 1950, and particularly by reaffirming the NOMA principle—nothing new here, and no cause for extended publicity:

> In his encyclical "Humani Generis" (1950) my predecessor Pius XII had already stated that there was no opposition between evolution and the doctrine of the faith about man and his vocation.

To emphasize the power of NOMA, John Paul poses a potential problem and a sound resolution: How can we possibly reconcile science's claim for physical continuity in human evolution with Catholicism's insistence that the soul must enter at a moment of divine infusion?

> With man, then, we find ourselves in the presence of an ontological difference, an ontological leap, one could say. However, does not the posing of such ontological discontinuity run counter to that physical continuity which seems to be the main thread of research into evolution in the field of physics and chemistry? Consideration of the method used in the various branches of knowledge makes it possible to reconcile two points of view which would seem irreconcilable. The sciences of observation describe and measure the multiple manifestations of life with increasing precision and correlate them with the time line. The moment of transition to the spiritual cannot be the object of this kind of observation.

The novelty and news value of John Paul's statement lies, rather, in his profound revision of Pius's second and rarely quoted claim that evolution, while conceivable in principle and reconcilable with religion, can cite little persuasive evidence in support, and may well be false. John Paul states—and I can only say amen, and thanks for noticing—that the half century between Pius surveying the ruins of World War II and his own pontificate heralding the dawn of a new millennium has witnessed such a growth of data, and such a refinement of theory, that evolution can no longer be doubted by people of goodwill and keen intellect:

> Pius XII added . . . that this opinion [evolution] should not be adopted as though it were a certain, proven doctrine . . . Today, almost half a century after the publication of the encyclical, new knowledge has led to the recognition of the theory of evolution as more than a hypothesis.[2] It is indeed remarkable that this theory has been progressively accepted by researchers, following a series of discoveries in various fields of knowledge. The convergence, neither sought nor fabricated, of the results of work that was conducted independently is in itself a significant argument in favor of the theory.

In conclusion, Pius had grudgingly admitted evolution as a legitimate hypothesis that he regarded as only tentatively supported and potentially (as he clearly hoped) untrue. John Paul, nearly fifty years later, reaffirms the legitimacy of evolution

under the NOMA principle—no news here—but then adds that additional data and theory have placed the factuality of evolution beyond reasonable doubt. Sincere Christians must now accept evolution not merely as a plausible possibility, but also as an effectively proven fact. In other words, official Catholic opinion on evolution has moved from "say it ain't so, but we can deal with it if we have to" (Pius's grudging view of 1950) to John Paul's entirely welcoming "it has been proven true; we always celebrate nature's factuality, and we look forward to interesting discussions of theological implications." I happily endorse this turn of events as gospel—literally good news. I may represent the magisterium of science, but *I welcome the support of a* primary leader from the other major magisterium of our complex lives. And I recall the wisdom of King Solomon: "As cold waters to a thirsty soul, so is good news from a far country" (Proverbs 25:25).

Rob Pudim

Just as religion must bear the cross of its hardliners, I have some scientific colleagues, including a few in prominent enough positions to wield influence by their writings, who view this rapprochement of the separate magisteria with dismay. To colleagues like me—agnostic scientists who welcome and celebrate the rapprochement, especially the Pope's latest statement—they say, "C'mon, be honest; you know that religion is addlepated, superstitious, old-fashioned BS. You're only making those welcoming noises because religion is so powerful, and we need to be diplomatic in order to buy public support for science." I do not think that many scientists hold this view, but such a position fills me with dismay—and I therefore end this essay with a personal statement about religion, as a testimony to what I regard as a virtual consensus among thoughtful scientists (who support the NOMA principle as firmly as the Pope does).

I am not, personally, a believer or a religious man in any sense of institutional commitment or practice. But I have great respect for religion, and the subject has always fascinated me, beyond almost all others (with a few exceptions, like evolution and paleontology). Much of this fascination lies in the stunning historical paradox that organized religion has fostered, throughout Western history, both the most unspeakable horrors and the most heartrending examples of human goodness in the face of personal danger. (The evil, I believe, lies in an occasional confluence of religion with secular power. The Catholic Church has sponsored its share of horrors, from Inquisitions to liquidations—but only because this institution held great secular power during so much of Western history. When my folks held such sway, more briefly and in Old Testament times, we committed similar atrocities with the same rationales.)

I believe, with all my heart, in a respectful, even loving, concordat between our magisteria—the NOMA concept. NOMA represents a principled position on moral and intellectual grounds, not a merely diplomatic solution. *NOMA also cuts both* ways. If religion can no longer dictate the nature of factual conclusions residing properly within the magisterium of science, then scientists cannot claim higher insight into moral truth from any superior knowledge of the world's empirical constitution. This mutual humility leads to important practical consequences in a world of such diverse passions.

Religion is too important for too many people to permit any dismissal or denigration of the comfort still sought by many folks from theology. I may, for example, privately suspect that papal insistence on divine infusion of the soul represents a sop to our fears, a device for maintaining a belief in human superiority within an evolutionary world offering no privileged position to any creature. But I also know that the subject of souls lies outside the magisterium of science. My world cannot prove or disprove such a notion, and the concept of souls cannot threaten or impact my domain. Moreover, while I cannot personally accept the Catholic view of souls, I surely honor the metaphorical value of such a concept both for grounding moral discussion, and for expressing what we most value about human potentiality: our decency, our care, and all the ethical and intellectual struggles that the evolution of consciousness imposed upon us.

As a moral position (and therefore not as a deduction from my knowledge of nature's factuality), I prefer the "cold bath" theory that nature can be truly "cruel" and "indifferent" in the utterly inappropriate terms of our ethical discourse—because nature does not exist for us, didn't know we were coming (we

are, after all, interlopers of the latest geological moment), and doesn't give a damn about us (speaking metaphorically). I regard such a position as liberating, not depressing, because we then gain the capacity to conduct moral discourse—and nothing could be more important—in our own terms, free from the delusion that we might read moral truth passively from nature's factuality.

But I recognize that such a position frightens many people, and that a more spiritual view of nature retains broad appeal (acknowledging the factuality of evolution, but still seeking some intrinsic meaning in human terms, and from the magisterium of religion). I do appreciate, for example, the struggles of a man who wrote to *The New York Times* on November 3, 1996, to declare both his pain and his endorsement of John Paul's statement:

> Pope John Paul II's acceptance of evolution touches the doubt in my heart. The problem of pain and suffering in a world created by a God who is all love and light is hard enough to bear, even if one is a creationist. But at least a creationist can say that the original creation, coming from the hand of God, was good, harmonious, innocent and gentle. What can one say about evolution, even a spiritual theory of evolution? Pain and suffering, mindless cruelty and terror are its means of creation. Evolution's engine is the grinding of predatory teeth upon the screaming, living flesh and bones of prey. . . . If evolution be true, my faith has rougher seas to sail.

Rob Pudim

I don't agree with this man, but we could have a terrific argument. I would push the "cold bath" theory; he would (presumably) advocate the theme of inherent spiritual meaning in nature, however opaque the signal. But we would both be enlightened and filled with better understanding of these deep and ultimately unanswerable issues. Here, I believe, lies the greatest strength and necessity of NOMA, the non-overlapping magisteria of science and religion. NOMA permits—indeed enjoins—the prospect of respectful discourse, of constant input from both magisteria toward the common goal of wisdom. If human beings can lay claim to anything special, we evolved as the only creatures that must ponder and talk. Pope John Paul II would surely point out to me that his magisterium has always recognized this uniqueness, for John's gospel begins by stating *in principio erat verbum*—in the beginning was the word.

Notes

1. Interestingly, the main thrust of these paragraphs does not address evolution in general, but lies in refuting a doctrine that Pius calls "polygenism," or the notion of human ancestry from multiple parents—for he regards such an idea as incompatible with the doctrine of original sin "which proceeds from a sin actually committed by an individual Adam and which, through generation, is passed on to all and is in everyone as his own." In this one instance, Pius may be transgressing the NOMA principle—but I cannot judge, for I do not understand the details of Catholic theology and therefore do not know how symbolically such a statement may be read. If Pius is arguing that we cannot entertain a theory about derivation of all modern humans from an ancestral population rather than through an ancestral individual (a potential fact) because such an idea would question the doctrine of original sin (a theological construct), then I would declare him out of line for letting the magisterium of religion dictate a conclusion within the magisterium of science.

2. This passage, here correctly translated, provides a fascinating example of the subtleties and inherent ambiguities in rendering one language into another. Translation may be the most difficult of all arts, and meanings have been reversed (and wars fought) for perfectly understandable reasons. The Pope originally issued his statement in French, where this phrase read ". . . *de norsvelles connaissances conduisent à reconnaitre dans la théorie de l'évolution plus qu'une hypothése.*" *L'Osservatore Romano*, the official Vatican newspaper, translated this passage as: "new knowledge has led to the recognition of more than one hypothesis in the theory of evolution." This version (obviously, given the official Vatican source) then appeared in all English commentaries, including the original version of this essay.

I included this original translation, but I was profoundly puzzled. Why should the Pope be speaking of *several* hypotheses within the framework of evolutionary theory? But I had no means to resolve my confusion, so I assumed that the Pope had probably fallen under the false impression (a fairly common misconception) that, although evolution had been documented beyond reasonable doubt, natural selection had fallen under suspicion as a primary mechanism, while other alternatives had risen to prominence.

Other theologians and scientists were equally puzzled, leading to inquiries and a resolution of the problem as an error in translation (as many of us would have realized right away if we had seen the original French, or even known that the document had been issued in French). The problem lies with ambiguity in double meaning for the indefinite article in French—where *un* (feminine *une*) can mean either "a" or "one." Clearly, the Pope had meant that the theory of evolution had now become strong enough to rank as "more than *a* hypothesis" (*plus qu'une hypothése*), but the Vatican originally read *une* as "one" and gave the almost opposite rendition: "more than *one* hypothesis." *Caveat emptor.*

I thank about a dozen correspondents for pointing out this error, and the Vatican's acknowledgment, to me. I am especially grateful to Boyce Rensberger, one of America's most astute journalists on evolutionary subjects, and David M. Byers, executive director of the National Conference of Catholic Bishops' Committee on Science and Human Values. Byers affirms the NOMA principle by writing to me: "Thank you for your recent article . . . It admirably captures the relationship between science and religion that the Catholic Bishops' Committee works to promote and to realize. The text of the October 1996 papal statement from which you were working contains a mistranslation of a key phrase; the correct translation supports your thesis with even greater force." □

You Can't Have It Both Ways: Irreconcilable Differences?

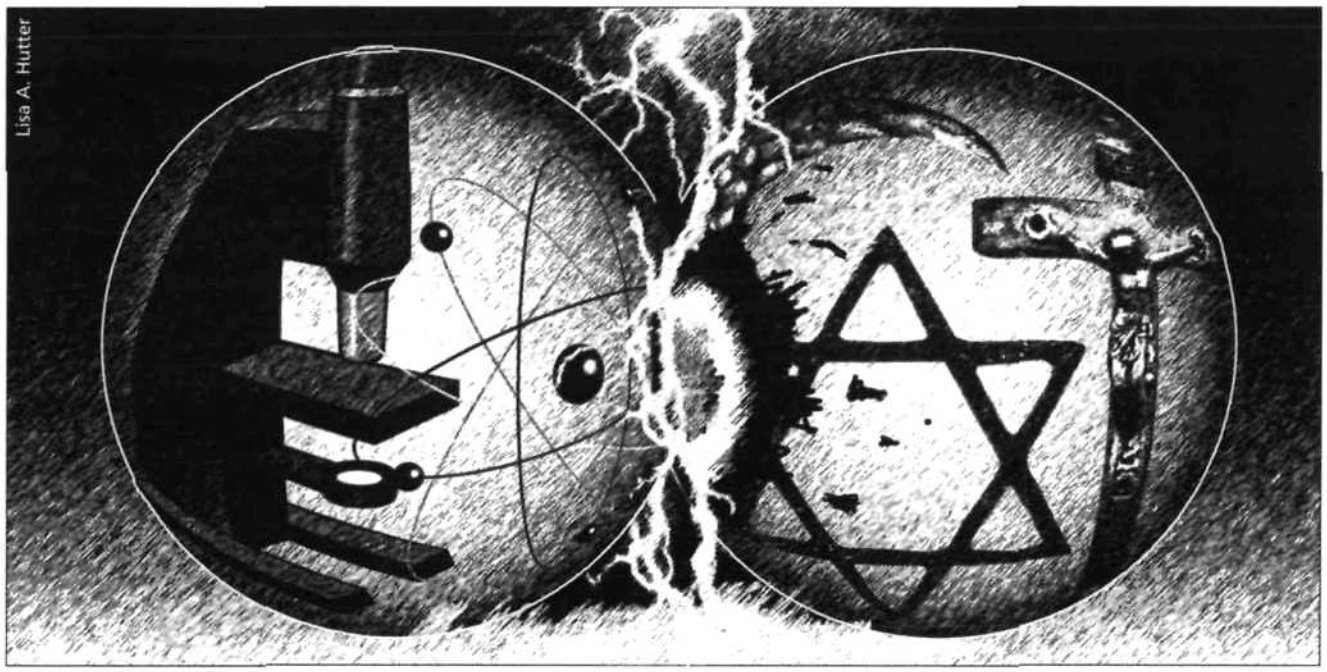
There is something dishonestly self-serving in the tactic of claiming that all religious beliefs are outside the domain of science.

RICHARD DAWKINS

A cowardly flabbiness of the intellect afflicts otherwise rational people confronted with long-established religions (though, significantly, not in the face of younger traditions such as Scientology or the Moonies). S. J. Gould, commenting in his *Natural History* column on the Pope's attitude to evolution, is representative of a dominant strain of conciliatory thought, among believers and nonbelievers alike:

> Science and religion are not in conflict, for their teachings occupy distinctly different domains . . . I believe, with all my heart, in a respectful, even *loving* concordat [my emphasis]. . . .

Well, what are these two distinctly different domains, these "Non-overlapping Magisteria" which should snuggle



up together in a respectful and loving concordat? Gould again:

> The net of science covers the empirical universe: what is it made of (fact) and why does it work this way (theory). The net of religion extends over questions of moral meaning and value.

Would that it were that tidy. In a moment I'll look at what the Pope actually says about evolution, and then at other claims of his church, to see if they really are so neatly distinct from the domain of science. First though, a brief aside on the claim that religion has some special expertise to offer us on moral questions. This is often blithely accepted even by the nonreligious, presumably in the course of a civilized "bending over backwards" to concede the best point your opponent has to offer—however weak that best point may be.

The question, "What is right and what is wrong?" is a genuinely difficult question which science certainly cannot answer. Given a moral premise or a priori moral belief, the important and rigorous discipline of secular moral philosophy can pursue scientific or logical modes of reasoning to point up hidden implications of such beliefs, and hidden inconsistencies between them. But the absolute moral premises themselves must come from elsewhere, presumably from unargued conviction. Or, it might be hoped, from religion—meaning some combination of authority, revelation, tradition and scripture.

Unfortunately, the hope that religion might provide a bedrock, from which our otherwise sand-based morals can be derived, is a forlorn one. In practice no civilized person uses scripture as ultimate authority for moral reasoning. Instead, we pick and choose the nice bits of scripture (like the Sermon on the Mount) and blithely ignore the nasty bits (like the obligation to stone adulteresses, execute apostates, and punish the grandchildren of offenders). The God of the Old Testament himself, with his pitilessly vengeful jealousy, his racism, sexism, and terrifying bloodlust, will not be adopted as a literal role model by anybody you or I would wish to know. Yes, *of course* it is unfair to judge the customs of an earlier era by the enlightened standards of our own. But that is precisely my *point!* Evidently, we have some alternative source of ultimate moral conviction which overrides scripture when it suits us.

That alternative source seems to be some kind of liberal consensus of decency and natural justice which changes over historical time, frequently under the influence of secular reformists. Admittedly, that doesn't sound like bedrock. But in practice we, including the religious among us, give it higher priority than scripture. In practice we more or less ignore scripture, quoting it when it supports our liberal consensus, quietly forgetting it when it doesn't. And, wherever that liberal consensus comes from, it is available to all of us, whether we are religious or not.

Similarly, great religious teachers like Jesus or Gautama Buddha may inspire us, by their good example, to adopt their personal moral convictions. But again we pick and choose among religious leaders, avoiding the bad examples of Jim Jones or Charles Manson, and we may choose good secular role models such as Jawaharlal Nehru or Nelson Mandela.

Richard Dawkins's latest book—which has nothing to do with religion—is Unweaving the Rainbow *(Houghton Mifflin). He is an Oxford University zoologist and CSICOP Fellow. This article was originally published in* Quarterly Review of Biology, *Vol. 72, pages 397–399, 1997, as one of a series of four commissioned commentaries on the Pope's Message on Evolution. The title chosen by the Editors of* Quarterly Review of Biology *was "Obscurantism to the Rescue." The article was subsequently reprinted in* Free Inquiry *under a different title again.*

Traditions too, however anciently followed, may be good or bad, and we use our secular judgment of decency and natural justice to decide which ones to follow, which to give up.

But that discussion of moral values was a digression. I now turn to my main topic of evolution, and whether the Pope lives up to the ideal of keeping off the scientific grass. His Message on *Evolution to the Pontifical Academy of Sciences begins with* some casuistical doubletalk designed to reconcile what John Paul is about to say with the previous, more equivocal pronouncements of Pius XII whose acceptance of evolution was comparatively grudging and reluctant. Then the Pope comes to the harder task of reconciling scientific evidence with "revelation."

> Revelation teaches us that [man] was created in the image and likeness of God . . . if the human body takes its origin from pre-existent living matter, the spiritual soul is immediately created by God . . . Consequently, theories of evolution which, in accordance with the philosophies inspiring them, consider the mind as emerging from the forces of living matter, or as a mere epiphenomenon of this matter, are incompatible with the truth about man . . . With man, then, we find ourselves in the presence of an ontological difference, an ontological leap, one could say.

To do the Pope credit, at this point he recognizes the essential contradiction between the two positions he is attempting to reconcile:

> However, does not the posing of such ontological discontinuity run counter to that physical continuity which seems to be the main thread of research into evolution in the field of physics and chemistry?

Never fear. As so often in the past, obscurantism comes to the rescue:

> Consideration of the method used in the various branches of knowledge makes it possible to reconcile two points of view which would seen irreconcilable. The sciences of observation describe and measure the multiple manifestations of life with increasing precision and correlate them with the time line. The moment of transition to the spiritual cannot be the object of this kind of observation, which nevertheless can discover at the experimental level a series of very valuable signs indicating what is specific to the human being.

In plain language, there came a moment in the evolution of hominids when God intervened and injected a human soul into a previously animal lineage (When? A million years ago? Two million years ago? Between *Homo erectus* and *Homo sapiens*? Between 'archaic' *Homo sapiens* and *H. sapiens sapiens*?). The sudden injection is necessary, of course, otherwise there would be no distinction upon which to base Catholic morality, which is speciesist to the core. You can kill adult animals for meat, but abortion and euthanasia are murder because *human* life is involved.

Catholicism's "net" is not limited to moral considerations, if only because Catholic morals have scientific implications. Catholic morality demands the presence of a great gulf between *Homo sapiens* and the rest of the animal kingdom. Such a gulf is fundamentally anti-evolutionary. The sudden injection of an immortal soul in the time-line is an anti-evolutionary intrusion into the domain of science.

More generally it is completely unrealistic to claim, as Gould and many others do, that religion keeps itself away from science's turf, restricting itself to morals and values. A universe with a supernatural presence would be a fundamentally and qualitatively different kind of universe from one without. The difference is, inescapably, a scientific difference. Religions make existence claims, and this means scientific claims.

The same is true of many of the major doctrines of the Roman Catholic Church. The Virgin Birth, the bodily Assumption of the Blessed Virgin Mary, the Resurrection of Jesus, the survival of our own souls after death: these are all claims of a clearly scientific nature. Either Jesus had a corporeal father or he didn't. This is not a question of "values" or "morals," it is a question of sober fact. We may not have the evidence to answer it, but it is a scientific question, nevertheless. You may be sure that, if any evidence supporting the claim were discovered, the Vatican would not be reticent in promoting it.

Either Mary's body decayed when she died, or it was physically removed from this planet to Heaven. The official Roman Catholic doctrine of Assumption, promulgated as recently as 1950, implies that Heaven has a physical location and exists in the domain of physical reality—how else could the physical body of a woman go there? I am not, here, saying that the doctrine of the Assumption of the Virgin is necessarily false (although of course I think it is). I am simply rebutting the claim that it is outside the domain of science. On the contrary, the Assumption of the Virgin is transparently a scientific theory. So is the theory that our souls survive bodily death and so are all stories of angelic visitations, Marian manifestations, and miracles of all types.

There is something dishonestly self-serving in the tactic of claiming that all religious beliefs are outside the domain of science. On the one hand miracle stories and the promise of life after death are used to impress simple people, win converts, and swell congregations. It is precisely their scientific power that gives these stories their popular appeal. But at the same time it is considered below the belt to subject the same stories to the ordinary rigors of scientific criticism: these are religious matters and therefore outside the domain of science. But you cannot have it both ways. At least, religious theorists and apologists should not be allowed to get away with having it both ways. Unfortunately all too many of us, including nonreligious people, are unaccountably ready to let them get away with it.

I suppose it is gratifying to have the Pope as an ally in the struggle against fundamentalist creationism. It is certainly amusing to see the rug pulled out from under the feet of Catholic creationists such as Michael Behe. Even so, given a choice between honest-to-goodness fundamentalism on the one hand, and the obscurantist, disingenuous doublethink of the Roman Catholic Church on the other, I know which I prefer. □

The Concerns of Science

ERNST MAYR

It has been said that the scientist searches for truth, but many people who are not scientists claim the same. The world and all that is in it are the sphere of interest not only of scientists but also of theologians, philosophers, poets, and politicians. How can one make a demarcation between their concerns and those of the scientist?

How Science Differs from Theology

The demarcation between science and theology is perhaps easiest, because scientists do not invoke the supernatural to explain how the natural world works, and they do not rely on divine revelation to understand it. When early humans tried to give explanations for natural phenomena, particularly for disasters, invariably they invoked supernatural beings and forces, and even today divine revelation is as legitimate a source of truth for many pious Christians as is science. Virtually all scientists known to me personally have religion in the best sense of this word, but scientists do not invoke supernatural causation or divine revelation.

Another feature of science that distinguishes it from theology is its openness. Religions are characterized by their relative inviolability; in revealed religions, a difference in the interpretation of even a single word in the revealed founding document may lead to the origin of a new religion. This contrasts dramatically with the situation in any active field of science, where one finds different versions of almost any theory. New conjectures are made continuously, earlier ones are refuted, and at all times considerable intellectual diversity exists. Indeed, it is by a Darwinian process of variation and selection in the formation and testing of hypotheses that science advances.

Despite the openness of science to new facts and hypotheses, it must be said that virtually all scientists—somewhat like theologians—bring a set of what we might call "first principles" with them to the study of the natural world. One of these axiomatic assumptions is that there is a real world independent of human perceptions. This might be called the principle of objectivity (as opposed to subjectivity) or commonsense realism. This principle does not mean that individual scientists are always "objective" or even that objectivity among human beings is possible in any absolute sense. What it does mean is that an objective world exists outside of the influence of subjective human perception. Most scientists—though not all—believe in this axiom.

Second, scientists assume that this world is not chaotic but is structured in some way, and that most, if not all, aspects of this structure will yield to the tools of scientific investigation. A primary tool used in all scientific activity is testing. Every new fact and every new explanation must be tested again and again, preferably by different investigators using different methods. Every confirmation strengthens the probability of the "truth" of a fact or explanation, and every falsification or refutation strengthens the probability that an opposing theory is correct. One of the most characteristic features of science is this openness to challenge. The willingness to abandon currently accepted belief when a new, better one is proposed is an important demarcation between science and religious dogma.

The method used to test for "truth" in science will vary depending on whether one is testing a fact or an explanation. The existence of a continent of Atlantis between Europe and America became doubtful when no such continent was discovered during the first few Atlantic crossings in the period of discoveries during the late fifteenth and sixteenth centuries. After complete oceanographic surveys of the Atlantic Ocean were made and, even more convincingly, after photographs from satellites were taken in this century, the new evidence conclusively proved that no such continent exists. Often, in science, the absolute truth of a fact can be established. The absolute truth of an explanation or theory is much harder, and usually takes much longer, to gain acceptance. The "theory" of evolution through natural selection was not fully accepted as valid by scientists for over 100 years; and even today, in some religious sects, there are people who do not believe it.

Third, most scientists assume that there is historical and causal continuity among all phenomena in the material universe, and they include within the domain of legitimate scientific study everything known to exist or to happen in this universe. But they do not go beyond the material world. Theologians may also be interested in the physical world, but in addition they usually believe in a metaphysical or supernatural realm inhabited by souls, spirits, angels, or gods, and this heaven or nirvana is often believed to be the future resting place of all believers after death. Such supernatural constructions are beyond the scope of science.

Ernst Mayr is Alexander Agassiz Professor of Zoology, Emeritus, at Harvard University and the author of many books, including One Long Argument, The Growth of Biological Thought, Toward a New Philosophy of Biology, *and* Evolution and the Diversity of Life. *This is excerpted by permission from his book* This Is Biology: The Science of the Living World *(Belknap Press 1997).*

What Is God's Answer?

WOLF RODER

Skeptics and True Believers: The Exhilarating Connection Between Science and Religion. By Chet Raymo. Walker and Company, New York, 1998. ISBN 0802713386. 288 pp. Hardcover, $23.

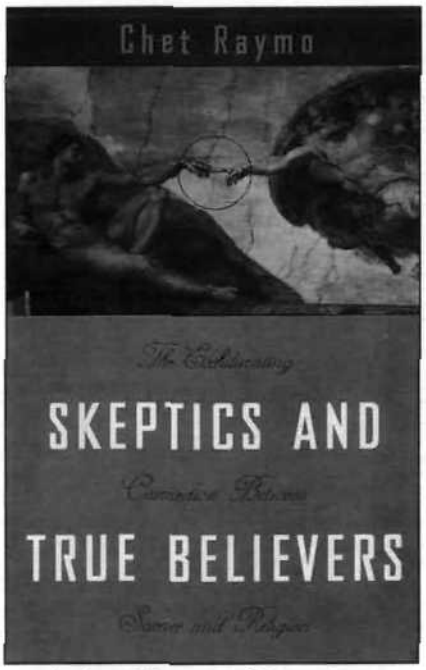
Let me begin by saying I think all skeptics ought to read this volume, and that is intended as high praise indeed. For one thing this book is written clearly and in a prose that often achieves a lyrical quality. Raymo, a physics professor, firmly rejects the mythical and supernatural, yet argues there need not be any conflict between science and religion.

At the end of the twentieth century, many educated people who want to believe there is more to the world than naturalistic materialism, or who grew up with a firm belief in a God, face a problem. There is a religious hole in their lives, for none of the images of God comfortably mesh with what science and reason tell us about the nature of the world or how the cosmos began and evolved.

Raymo divides the world into "skeptics," who follow and accept science and the scientific picture of reality, and "true believers," whose worldview includes the nonrational, angels, ghosts, miracles, and other both religious and secular supernatural. He does not deny the sense of make-believe that allows us to understand a child's need for Santa Claus or fairies. In adults this same sense of wonder allows an appreciation of poetry, fiction, and theater. In contrast, "The True Believer retains into adulthood an absolute faith in some forms of empirically unverifiable make-believe (such as astrology or the existence of immortal souls)" (p. 13).

Wolf Roder is a professor of geography at the University of Cincinnati in Ohio.

Raymo is clearly on the side of science, on the side of skeptics who demand rational evidence for their



conclusions. He quotes Newton's restatement of William of Ockham's principle (1295–1349), "We are to admit no more causes of natural things than such as are both true and sufficient to explain their appearance" (p. 107). This is the defining difference between skeptic and true believer. He describes the enterprise we call science as organized skepticism. In other words, Raymo throws out not only mythical baggage, from astrology to UFOs, but also religion, ranging from creationism to the stable in Bethlehem and the tablets of stone on Mount Sinai, as well as prayer, with all the tribal myths, scriptures, and church traditions. These may have represented the best knowledge of their time, but they have been superseded by the scientific story of the universe. To proclaim that "God did it" in order to explain natural phenomena is not merely contrary to science, but the end of search and investigation.

Raymo considers research a kind of mystical calling, an undertaking in which we interrogate God, His works and His intentions. Like many people, Raymo views the natural realities science has uncovered as more miraculous than those claimed by religion. He examines the role of DNA, noting that the entire DNA string, about three feet long, is curled up in a cell no more than fifteen micrometers across. Compared to that, what is so miraculous about the Turin Shroud, even if it really was the burial cloth of a first-century prophet?

While Raymo is quite clear that the scientific world view is incompatible with traditional religion, he has no patience with the sort of scientist who expects scientific theories to explain the ultimate meaning of the universe. He insists there is no end to knowledge, no final closure to research, no closure where science explains a theory of everything.

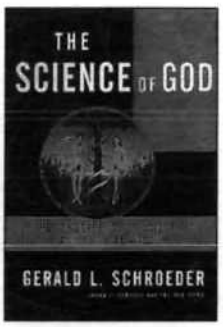
But science, skepticism, tolerance,

and belief in progress need not be alien to spiritual understanding and ethical behavior. "It is the thesis of this book that these qualities *must* be associated with any religion that will lead us out of our present spiritual malaise and provide a satisfactory moral compass for our inevitably scientific and technological future" (p. 162). He sees no reason why religion cannot come to terms with the scientific understanding of the cosmos, Earth, or the nature of humans.

The Hebrew scriptures tell us God created humans from the slime of the earth, and such is our understanding of what happened through geological history. But to say God fashioned man from dust, like a potter throws a clay pot on a wheel, "is a lovely story, but in its charming anthropomorphism vastly underestimates the power and process of God" (p. 181).

> The God of the spiraling powers resides in nature beyond all metaphors, beyond all scriptures, beyond all "final theories." It is the ground and source of our sense of wonderment, of power, of powerlessness, of light, of dark, of meaning, and of bafflement. It is the God whose history began with the first human who experienced awe, contingency, fear. It is the God of mystics of all cultures and creeds. We stand on the shore of knowledge and look out into the sea of mystery and speak his name. His name eludes all creeds and all theories of science. He is indeed the "dread essence beyond logic." (p. 214)

Ultimately, Raymo's God is beyond words as well. Raymo speaks of research as a sacred process, of the capacity for wonder at the existence of the cosmos, of the worlds, the stars, and the galaxies as a form of worship. He comments on the famous deep-space photograph taken by the Hubble space telescope as looking deep into the soul of the night. We see a breathtaking snowstorm of galaxies in living color, the most distant not long after the beginning of the universe. Since the beginning of religion wise men have asked, "What is the use of praying if God does not answer?" "In this wonderful image of more than a 1,000 galaxies, caught by a magnificent instrument lofted into space by a questioning creature, God answers" (p. 244).



Fitting the Bible to the Data

VICTOR J. STENGER

The Science of God: The Convergence of Scientific and Biblical Wisdom. By Gerald L. Schroeder. The Free Press, New York and London, 1997. ISBN 0 684-83736-6. 226 pp. Hardcover, $25.

How can both the Bible and science be right? Physicist Gerald Schroeder of the Weizmann Institute in Israel says he can show us how. Let's start with cosmology. The Bible says God created the universe in six days and indicates the passage of only about 6,000 years since then. Science currently estimates the visible universe to be about 13 billion years old, give or take a few billion. Schroeder reconciles the two, explaining that the six days of the Bible refer to a different measure of time. He explains: "There is no possible way for those first six days to have an Earth-based perspective simply because for the first two of those six days there was no Earth" (51).

Instead, time during this six-day period was measured on a cosmic clock. And what else could be used for that clock but the vibrations of light (electromagnetic waves)? Today the light from creation appears as the cosmic microwave background. This is now redshifted by a factor of a trillion (10^{12}) from the period of "quark confinement" when matter as we know it first began to form. Thus the cosmic clock at that epoch ran off a trillion days for each of our modern days. The six cosmic days of creation thus took about 15 billion years Earth time, give or take a few billion. So, according to the author, Genesis is not only consistent with cosmology, it gives the correct age of the universe!

Each of the six days in Schroeder's Genesis actually takes a different length of Earth time. Cosmic day one is 8 billion Earth years long and you divide by two to get the duration of each succeeding cosmic day. The universe begins 15.75 billion Earth years ago and during the first "day" light breaks free, as electrons bind to atomic nuclei, and galaxies begin to form. This is described in Gen. 1:1–5 as the creation followed by light separating from the darkness.

Cosmic day two starts 7.75 billion Earth years ago and lasts four billion Earth years. During this period the stars are born. This corresponds to Gen. 1:6–8, the formation of the heavenly firmament.

Cosmic day three starts 3.75 billion Earth years ago. During two billion Earth years, Earth cools, water appears, and the first life forms appear. In Gen. 1:9–13, vegetation first appears during the third day.

Cosmic day four starts 1.75 billion Earth years ago and lasts a billion Earth years. Earth's atmosphere becomes transparent and photosynthesis produces an oxygen-rich atmosphere. Schroeder says that this corresponds to Gen. 1: 14–19 when "the Sun, Moon, and stars become visible in the heavens" (67).

Victor Stenger is professor of physics and astronomy at the University of Hawaii. An earlier version of this review appeared in the Secular Web, http://www.infidels.org/. A shortened version appeared in Skeptical Briefs *8(4), December 1998.*

Cosmic day five starts 750 million Earth years ago and lasts 500 million Earth years. During this period, the first multicellular animals appear and the oceans swarm with life. Gen. 1:20–23 says the waters bring forth swarms of living creatures and "birds fly above the Earth" (94).

Cosmic day six starts 250 million years ago and ends at the time of Adam. During this period we have a massive extinction in which 90 percent of life is destroyed and then repopulated with humanoids and humans. This, Schroeder says, corresponds to what is described in Gen. 1:24–31.

Technically, Schroeder's formula gives the present as the end of the sixth day. However, it could just as well have ended a few thousand years ago and not affect the rest of the calculation where things are rounded off at hundreds of millions of years. Schroeder argues that after the six cosmic days of creation, Genesis switches its focus over to humanity and starts measuring time in human terms. The rest of the Bible concerns itself with the 6,000 Earth years since Adam and Eve, estimated from the Bible in Bishop Ussher fashion.

Schroeder does not deny the existence of hominid creatures before Adam. He talks about Neanderthals and Cro-Magnons, and accepts that they had developed tools, pottery, and many human-like qualities. In Lev. 11:33 the Bible talks about pottery. But Schroeder argues that since it never mentions the *invention* of pottery, that event must have pre-dated Adam (130).

According to Schroeder, the Bible has no interest in these pre-Adam hominids because they were not yet fully human and had no souls. Thus they are never mentioned. Adam represents the quantitative change to a large brain, but more important, the qualitative change that makes us different from all other forms of life: "our soul of human spirituality" (133). God breathed this into Adam, the first real human, 6,000 years ago.

Schroeder's attempt to connect thirty-one lines of Genesis to Big Bang cosmology and Earth paleontology makes entertaining reading, but will convince no one who is not already convinced or totally lacks critical faculties.

Let us return to the beginning. Schroeder's use of quark confinement as the defining moment for his cosmic time scale is completely arbitrary. He seems to have chosen it for no better reason than it gives the answer he wants. The redshift from quark confinement to the present is of the order of 10^{12}. Multiplying this by six days gives 15 billion years, which is consistent with our current estimate for the age of the universe.

Alternatively, Schroeder might have chosen the moment in the early universe called "decoupling," which represents the point where radiation separates from matter. Indeed, he relates this event to the separation of "the light from the darkness" described in Genesis as happening on day one. But the redshift from decoupling to the present is only of the order of 1,000, which would give an Earth time interval of only fifteen years for the six cosmic days of creation. If he had chosen some other moment, he would have obtained yet a different time scale.

Furthermore, by Schroeder's own formula the creation corresponds to the time of quark confinement. Blueshifting back from that point rather than redshifting ahead, the events prior to quark confinement would recede infinitely into the past, in Earth time, and we would have no creation at all.

Schroeder's decision to divide by two to give a new Earth period for each cosmic day is not justified by his argument that Earth time is simply redshifted cosmic time. While such a formula might apply for the inflationary epoch in the early universe, that had ended by the time of quark confinement.

Afterwards we have the Hubble expansion in which the redshift varies roughly linearly with time. By having each cosmic day half as long as the preceding one in Earth years, again a completely arbitrary, unjustified procedure, Schroeder is able to vaguely relate events known from cosmology to those described in Genesis.

In cosmic day two the "firmament" is created. Note that Schroeder excludes from the "firmament" all galaxies more than 7.75 billion light years away, of which there are many—indeed, most. Furthermore, he sees no problem with calling the expanding universe a "firmament." Like all apologists, he selects his data carefully, accepting only those that agree with his hypotheses while ignoring those that do not.

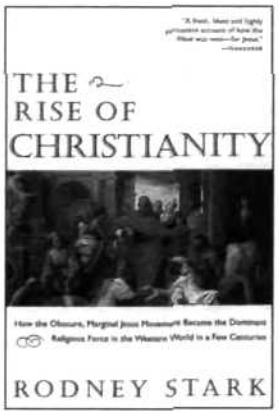
Primitive life first appears in cosmic day three. Here again it takes some mighty stretching to associate what is described in the Bible for the third day, including fruit trees, with the primitive life described by paleontology for that epoch.

Schroeder has the Sun, Moon, and stars becoming visible in cosmic day four. In fact, Genesis seems to say that the Sun, Moon, and stars are created at that time—well after Earth was created.

Cosmic day five has the waters teeming with life. But the biblical verses imply birds as well. Schroeder says that "birds" is a mistranslation and that the Bible here is referring to water insects instead. Translation is so easy when you know what you want a passage to say.

Cosmic day six contains the mass extinctions of life that occurred 65 million years ago. The biblical verses referenced make no mention of mass extinction. The biblical Flood occurs well after Adam, essentially today by Schroeder's reckoning, but he needs to end the six days of creation with Adam for other purposes. This is one event he simply cannot make fit, although he covers this up and leaves the impression that everything is consistent.

It takes quite a stretch of both the imagination as well as the time scale to make the biblical story of creation match that of modern cosmology. In showing us how to make six days last 15 billion years, Gerald Schroeder has demonstrated plenitude of imagination.



New Answers About the Early Christian Movement

MARK W. DURM

The Rise of Christianity: A Sociologist Reconsiders History. By Rodney Stark. Princeton University Press, Princeton, N.J. 1996, ISBN: 0-691-02749-8. 246 pp. Hardcover, $35, softcover, $14.

Most research conducted and most manuscripts written concerning the first century A.D. have centered around the belief that the early Christian movement shaped society. This has been the answer for ages. Rodney Stark, author of *The Rise of Christianity: A Sociologist Reconsiders History* questions this traditional answer. He proffers the possibility that society and social events may have help shaped Christianity.

Stark has written a "must read" book for anyone interested in an objective study of early Christianity. His approach is two-fold. First, Stark introduces real social science into the analysis. This includes the role of social networks and interpersonal attachments in conversion, the theory of formal rational choice, dynamic population models, social epidemiology, and the importance of religious economies. His second objective is to share with social scientists the immense scholarly treasures that can be found from the modern studies of antiquity.

Stark writes in the beginning of this book:

> . . .[A]ll questions concerning the rise of Christianity are one: How was it done? How did a tiny and obscure messianic movement from the edge of the Roman Empire dislodge classical paganism and become the dominant faith of Western civilization? Although this is the only question, it requires many answers—no one thing led to the triumph of Christianity.

The first answer he entertains is the "Arithmetic of Growth" theory, using dynamic population models. Stark recounts how studies of the rise of Christianity all emphasize the religion's rapid growth, but they never offer any statistics in support. Stark begins with the three references in *Acts of the Apostles* regarding the number of early Christians (Acts 1:14–15; 4: 4; and 21:20) and discusses how most historians discount these figures as inflated.

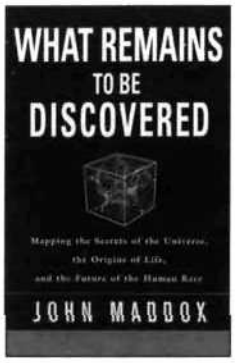
The believers in Christianity usually portray the rapid growth as miraculous. Stark shows that this "extraordinary" growth as probably just ordinary arithmetical increases due to an annual 3.42 percent increase. This annual growth accumulates to 40 percent for every decade and even actually resembles the numbers give in *Acts of the Apostles.* Stark's analysis reveals that this small annual percentage would increase the number of Christians to 33,882,008 by the year A.D. 350. Stark's 3.42 percent annual estimate was based on very careful mathematical and historical analyses. Thus, given time, simple arithmetical increases will balloon to great numbers. Surprisingly, according to Stark, a large portion of this annual increase came from the educated, cosmopolitan classes. Since Christianity offered new concepts and was not linked to a certain ethnic group, it had a following among people trying to assimilate into the dominant culture, primarily Hellenized Jews.

A second social index that Stark believes contributed greatly to the growth of the early church was the role exercised by women. Contrary to contemporary beliefs that the early church was patriarchal and sexist, the early church was so attractive to women that in 370 the emperor Valentinian gave a written order to Pope Damasus I forbidding the practice of Christian missionaries trying to convert pagan women. Women enjoyed a much higher status in the Christian faith than did women in the Greco-Roman world. Stark builds a case that relatively high rates of intermarriage existed between Christian women and pagan men and suggests how these would have caused many "secondary" conversions to Christianity. For example, more women than men converted to early Christianity, due in part to the Christian prohibition against infanticide and abortion. In the Greco-Roman world, female babies could legally be killed, and fewer female babies means fewer women later. Eventually, there were more Christian women of marriageable age and a shortage of such women in the pagan world.

Another important contributor to Christian growth was the role of epidemics, especially the great epidemic ("Plague of Galen") of the second century. Stark suggests that the philosophy the Christians practiced, of selflessness and caring for the sick, created in the Christian community a stronghold of mutual aid, which resulted in a superior survival rate to that of the Greco-Roman pagans.

In conclusion, in this readable, fast-paced book, Rodney Stark offers a fresh and entertaining perspective to the multifaceted movement known as early Christianity. This is a new answer to an old answer!

Mark W. Durm is a professor of psychology at Athens State University, Athens, Alabama.



Unsolved Mysteries of the Best Kind

TOM FLYNN

What Remains to Be Discovered: Mapping the Secrets of the Universe, the Origins of Life, and the Future of the Human Race. By John Maddox. Martin Kessler Books/The Free Press, New York, 1998. ISBN 0-684-82292-X. 434 pp. Hardcover, $26.

When John Horgan left *Scientific American* to publish his 1996 announcement of "the end of science," (and a book of the same name) skeptics were, well, skeptical. (Stephen Hawking called it "garbage.") Horgan argued that science had solved all the big problems that lay within its realm. All that remained was filling in the details. Sir John Maddox may not have intended his new book as a reply to Horgan, but many have seen it that way. It effortlessly demolishes Horgan's thesis as it compiles a stunning census of all the unsolved mysteries that remain for scientists of the next century to sink their teeth into.

Tom Flynn is director of the Center for Inquiry — International.

Maddox, a CSICOP fellow, was twice editor of *Nature*, most recently from 1980 to 1996. In this masterful book he claims a place alongside Richard Dawkins, Daniel C. Dennett, and Stephen Jay Gould as one of our foremost science popularizers. Maddox does nothing less than to survey the state of every major science at the end of the twentieth century. He concludes that "science, far from being at an end, has a long agenda ahead of it."

For Maddox, scientific discovery is like unscrewing one of those Russian dolls with a series of smaller dolls inside; each breakthrough casts the seeds of new unknowns that could not even have been imagined before. "The record of previous centuries suggests that the excitement in the years ahead will spring from the answers to the questions we do not yet know enough to ask." For that reason, Maddox knows better than to try predicting just which puzzles scientists will tackle in the coming century.

Maddox goes beyond simply enumerating mysteries; he gives free expression to his own sometimes controversial opinions. He advocates vigorous research to counter global warming and impacts from space objects; he urges aggressive application of new discoveries in genetics, perhaps even manipulation of the human genome to blunt inherent instabilities that may lurk in its makeup. (Yet he favors legal moratoria on human cloning research.) In the cosmological controversy over black holes, he is unblushingly partisan; he finds them "dubious." If Maddox's opinions ever endanger the objectivity of his reporting, it is here.

But that is a quibble compared to the achievement this book represents. If you've been troubled that John Horgan might actually be on to something, read *What Remains to Be Discovered* and fasten your seat belts. The best in science is yet to come. □

NEW BOOKS

Listing does not preclude future review.

Rocks of Ages: Science and Religion in the Fullness of Life. **Stephen Jay Gould.** Ballantine Publishing Group, New York, 1999. ISBN 0-345-43009-3. 240 pp. Hardcover, $18.95. A new book-length elaboration of Gould's thesis that science and religion need not be in conflict. Gould, an agnostic scientist who nevertheless is respectful of religion, notes that "many crucial problems in our complex lives find better resolution under the opposite strategy of principled and respectful separation." He proposes that we "encapsulate this central principle of respectful noninterference—accompanied by intense dialogue between the two distinct subjects, each covering a central facet of human existence—by enunciating the Principle of NOMA, or Non-Overlapping Magisteria." He uses the NOMA principle to examine "the false conflict" between science and religion. NOMA, he insists, represents a principled position on moral and intellectual grounds, not merely a diplomatic decision. He also notes that it cuts both ways. "If religion can no longer dictate the nature of factual conclusions residing properly within the magisterium of science, then scientists cannot claim higher insight into moral truth from any superior knowledge of the world's empirical constitution." Four chapters deal with The Problem Resolved in Principle: Historical Reasons for Conflict; Defending NOMA from Both Sides Now; The Struggle Against Modern Creationism; and Psychological Reason for Conflict. Thoughtful and provocative. The chapter on creationism, which he labels "a distinctively American violation of NOMA," paints the dispute as "political and specific, not religious at all." It includes Gould's experience testifying at the Arkansas creationism trial at which he and six other expert witnesses were successful in showing that, as he puts it, "'creation science' is nothing but a smoke screen, a meaningless and oxymoronic phrase invented as sheep's clothing for the old wolf of Genesis literalism, already identified in the Epperson case as a partisan theological doctrine, not a scientific concept at all—and clearly in violation of First Amendment guarantees. . . ." (See Gould's article "Non-Overlapping Magisteria" in this issue.)

Tower of Babel: The Evidence Against the New Creationism. **Robert T. Pennock.** MIT Press, Cambridge, Mass., 1999. ISBN 0-262-16180-X. 429 pp. Hardcover, $35. Creationism and its new advocates have become more sophisticated. They use the term "intelligent design" rather than "creation science" and aim their arguments against the naturalistic philosophic method that underlies science, seeking to replace it with "theistic science." A University of Texas philosopher of science compares the views of the new creationists with those of the old and reveals how their arguments fail the tests of logic and evidence. One unique feature is a chapter on the evolution of languages. Linguistic evolution has strong theoretical parallels with biological evolution and is also relevant to creationism, in that Genesis says languages did not evolve but were specially created by God. Pennock relates how he slowly came to take the new creationism more seriously after seeing the size and renewed power of the movement. Many students now come to class with mental defenses prepared by creationists so that they will not be "brainwashed" into accepting evolutionary theory, or they come with antievolutionary tracts to hand out. The vehemence of creationism's aggressive new tack is a concern. Pennock devotes several chapters to the work of Phillip Johnson, one of the most influential leaders of the new creationism. He shows how science uses naturalism and argues for keeping private religious beliefs separate from public scientific knowledge. Pennock says the creationism controversy is not just about biological evolution but is a clash of religious and philosophical worldviews, in which the creationists do everything they can to paint evolutionists as undermining morality and meaning. He addresses these and many other issues.

The Bible According to Einstein. Jupiter Scientific Publishing Co., P.O. Box 250586, New York, NY 10025. 1999. ISBN 0-9655176-9-1. 634 pp. Hardcover, $34.95. The scientific story of the universe, Earth, and life told in poetic language, narrative form, and organized as in the biblical books. This highly original work's "Old Testament" narrates the story of the world from the initial moments of creation ("In the beginning there was almost nothing. The Universe was very very very hot and very very very small. From this *senseless void* emerged *thy World.*") as informed by modern physics and cosmology. The "New Testament" provides the laws of nature and humanity's intellectual, spiritual, and scientific development, starting with Homogenesis ("And it came to pass that a thunderstorm swept over eastern central Africa. . . . And out of this steamy jungle and into an open field emerged an ape-like creature. . . . Now this female proto-hominid was different from the proto-hominids of the middle-Miocene, for she spent more time on land than in the trees. . . .") Man's cultural history follows, including discovery of evolution by Darwin. The books then return to the laws of nature, quantum physics, relativity, the birth of galaxies, the creation of our galaxy, the origin of Earth and the Moon, and planets, and the natural events leading to the origins of life ("Henceforth, the sea produced a billion-billion proto-cells which 'lived' a billion-billion 'lives.' But proto-cells could not beget themselves. And tens of millions of years did pass and disappear. . . . And millions of years passed. . . .Then one night, a certain group of molecules combined. . . . But then, spontaneously did it divide in two. . . . And soon the seas were filled with many many living and dividing cells.") This is an epic work, befitting the subject. It's also a curious one, for how it will be received is hard to predict (three Nobel laureate scientists and the president of the American Anthropological Association have praised it). Scientists, skeptics, and humanists should find it intriguing. It's the kind of experiment in relating the scientific story of the world in parable form—telling the great story of nature in a form that has been shown to have great teaching power—that some prominent scientists have long recommended. The work lists no author. Professor Stuart Samuel of Columbia University has been designated the book's "spokesman."

—Kendrick Frazier

ARTICLES OF NOTE

Blackmore, Susan. "Meme, Myself, I." *New Scientist*, March 13, 1999, pp. 40–44. Memes, a term coined by Richard Dawkins in 1976, are ideas, skills, habits, stories, songs, or inventions that are passed from person to person by imitation. They have shaped our minds, leading to the evolution of big brains and language. Here, as she does in her new book *The Meme Machine*, psychologist Susan Blackmore argues that "the idea of 'self'" is an illusion. You are nothing more than a creation of genes and memes in a unique environment. . . . The memes with the cleverest trick are those that persuade us that our 'selves' really exist." Giving us the illusion of "self," she says, helps memes survive and spread.

Brumble, H. David. "Vine Deloria Jr., Creationism, and Ethnic Pseudoscience." Reports of the National Center for Science Education, 18(6): 10–14, November/December 1998 (published April 1999). Vine Deloria is an important American Indian author, and so his book *Red Earth, White Lies*, which indicts White man's science, is potentially influential. Brumble documents how wrong Deloria is on subjects such as the age of Earth, dinosaurs and human beings, Noah's flood, Pilgrims and mammoths, evolution, the character of science, and ethnicity. "Deloria's closest pseudoscientific cousins may be in the Afrocentric movement," says Brumble.

Carter, Meg. "Alien Intelligence." *The Independent* (London), March 13, 1999. "Just in time for the millennium," says this editorial column, "skepticism is attracting a following here [in Britain]." The piece recounts some of the irrationality in current vogue, and says, "Thank goodness for the skeptics then." The skeptical movement founded in the U.S. in 1976 has resulted in, today in Britain, two skeptic magazines, *The Skeptic* and *The Skeptical Intelligencer*. Good brief discussion of the issues.

Davis, Edward B. "Of Gods and Gaps: Intelligent Design and Darwinian Evolution." *Reports of the National Center for Science Education*, 18(6): 20–23, November/December 1998 (published April 1999). Critical essay review of three neo-creationist tracts: Behe's *Darwin's Black Box*, Johnson's *Defeating Darwinism by Opening Minds*, and Moreland's *The Creation Hypothesis*.

Kalal, David M. "Critical Thinking in Clinical Practice: Pseudoscience, Fad Psychology, and the Behavioral Therapist." *The Behavior Therapist*, 22: 81–84, April 1999. Excellent, well-referenced critique and discussion of the "deluge of pseudoscientific pop psychology" that appeals to an "overly credulous public" that has an "ill-informed interest in the psychological sciences." Argues that as behavioral therapists, "we can actively educate ourselves, our colleagues, and the public about the important difference between science and pseudoscience and the role that the latter plays in psychology." Provides suggestions for what scientists and

clinicians can do "to stem the rising tide of pseudoscientific treatments. . . ."

Orans, Martin. "Mead Misrepresented." *Science*, 283:1649–1650, March 12, 1999. Review highly critical of Derek Freeman's new book *The Fateful Hoaxing of Margaret Mead.* (The Mead-Freeman controversy was the subject of two recent SI articles, referred to in this review, and further exchanges between Freeman, Paul Shankman, and James Côté in the May/June 1999 issue.) Orans says bluntly of Freeman's claim that Mead was hoaxed by two Samoan women into believing Samoa was a promiscuous society, "The alleged crime never took place." As for a so-called "smoking gun" letter of Mead, Orans says Freeman repeatedly ignores wording in the letter that contradicts Freeman's contentions. As for Freeman's wider concerns about the philosophical views and influence of Mead's mentor, Franz Boas, Orans says, "Freeman's characterization of Boas's views on biology, behavior, culture, and evolution is demonstrably false." He adds, "Clearly Freeman's view of Boas is, if anything, even less reliable than his account of Mead." He concludes, "It is a shame that his vehicle, *Fateful Hoaxing*, rides roughshod over the evidence." Another noteworthy review of the Freeman book, by anthropologist Melvin Konner in *Nature* (398:117–118, March 11, 1999) is a little more charitable but nevertheless concludes that Freeman does not prove that Mead's hoaxing was "fateful." She got some things wrong, Konner concedes, but he recounts a half dozen genuine *cause célèbres* of twentieth century anthropology to each of which Mead made "a significant contribution." Says Konner: "Mead's reputation endures."

Perrucci, Robert, and Leon E. Trachtman. "Science Under Siege: Interest Group Politics Confront Scientific Knowledge and Authority." *International Journal of Contemporary Sociology*, 35(2): 217–242, October 1998. Purdue University scholars ask whether the so-called "science wars" are a passing academic pursuit or a reflection of real popular disenchantment with science. They carried out in-depth interviews with sixty members of groups with alleged "anti-science" attitudes in an attempt to discover the nature of the critiques and whether they reveal a general cynicism or only the special interests of each group.

"Scientists & Thinkers of the 20th Century." *Time.* March 29, 1999 (entire issue). This special issue of *Time* on the Great Minds of the Century is a tribute to the people who split the atom; probed the psyche; spliced genes; invented plastic, radar, and the silicon chip; built airplanes, rockets, satellites, televisions, computers, and atom bombs; and overthrew our ideas about logic, language, learning, mathematics, economics, and even space and time. Brief, lively profiles of the century's greatest scientists, scholars, and creators, some by equally famous persons of today (Bill Gates writes about the Wright Brothers, Donald Johanson profiles his rivals the Leakeys). There's even a spread on Cranks, Villains, and Unsung Heroes.

—Kendrick Frazier

SCIENCE BEST SELLERS

Top Ten Best Sellers in **Cambridge, UK**

1. ***The Little Book of Science***
   John Gribbin;
   Penguin
2. ***The Elegant Universe***
   Brian Greene;
   Jonathan Cape
3. ***West Country Eclipse***
   Patrick Moore;
   South Downs Planetary Trust
4. ***The Meme Machine***
   Susan Blackmore;
   Oxford University Press
5. ***The Calendar***
   David Ewing Duncan;
   Fourth Estate
6. ***Mathematics for Beginners***
   David Corfield;
   Icon
7. ***The Darwin Wars***
   Andrew Brown;
   Simon & Schuster
8. ***Unweaving the Rainbow***
   Richard Dawkins;
   Allen Lane
9. ***What Remains to be Discovered***
   John Maddox;
   Macmillan
10. ***The White Death***
    Thomas Dormandy;
    Hambledon Press

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Superstition and the Regression Effect

I read with interest Justin Kruger, Kenneth Savitsky, and Thomas Gilovich's excellent summary of the regression effect (March/April 1999), as I have a considerable interest in the pervasive but underreported phenomenon. I can substantiate their suppositions in two areas, sports and film sequels, from research I conducted a few years ago. Baseball is an excellent example. During the period from 1956 to 1990, of the 58 Cy Young award winning pitchers, 52 had fewer victories the following season; 44 had more losses; 50 had higher earned run averages; and 6 of the 7 relief pitchers had fewer saves. Team performance is even more indicative of the regression effect. An examination of winning percentages of the four divisional first and last place teams from 1969 to 1991 revealed a clear trend. First-place teams lose about eight more games the following year, while last-place teams increased their victory total by about the same margin. Of the 23 teams with best overall records during that period, 22 lost more games the following year. Contrarily, 22 of the 23 teams with the worst records improved their record the next season.

The "sequel effect" is also substantiated. I compared reviewer ratings of the 400 films that generated at least one sequel from 1921 to 1993 to the corresponding rating of their sequel(s). On average, sequels dropped a half star (2.7 to 2.2), on a scale of one to four, where 2-1/2 stars is average. Interestingly, additional sequels beyond the first did not significantly differ in their average rating, also averaging roughly 2.2 stars.

Congratulations to the authors on an excellent presentation of this important influence on behavior.

James L. Spencer
Professor of Psychology
West Virginia State College
Institute, W. Va.

As I was reading the article "Superstition and the Regression Effect" by Justin Kruger, Kenneth Savitsky and Thomas Gilovich it occurred to me that I had come across the described "regression effect" before. After a little thought, I remembered the source, which turns out to have been an appropriate one, considering that the authors later discuss some of the implications of the regression effect in the world of sports.

In his *Baseball Abstract* of 1983, the baseball analyst and sabermetrician Bill James (who is, to my mind, a powerful wielder of the scientific method, a superb example of how the scientific worldview can function well in non-science fields, and a certified skeptic about baseball's accumulated lore of truisms and common knowledge) described what he referred to as "The Law of Competitive Balance." In his 1989 anthology *This Time Let's Not Eat the Bones*, James describes the law in this way:

> The Law of Competitive Balance states that all things in baseball are drawn powerfully to the center. Teams which win a lot of games in one season show a powerful tendency to win fewer in the next year. Players who hit for a high batting average in any season have a powerful tendency to decline in batting average in the next season.

James also describes "The Plexiglas Principle":

> [W]hen a team improves in one season, they tend to decline in the next season; when they decline in one season, they tend to improve in the next season. In other words, resistance is a more powerful shaping force in baseball than is momentum, at least in this limited effect.

Most appropriately, the concept of "random error" your authors describe as being important in a "multi-determined" situation—where factors out of the control of the participants can have a strong effect on the eventual outcome—also seems very applicable to sports, where many talented teams have failed to reach their goals due to circumstances they could neither predict nor control.

Ed Fitzgerald
New York, N.Y.

I was surprised that Kruger, Savitsky, and Gilovich did not mention the education field in their examples. The regression effect is an enemy to magnet school teachers. It is impossible for all of the selected students to continue scoring in the top bracket, and guess who gets the blame! On the other hand, the regression effect is a friend to special ed teachers. It is impossible for all the selected students to continue scoring in the bottom bracket, and guess who gets the credit!

Thomas L. Robertson III
Knoxville, Tenn.

A comment on "Superstition and the Regression Effect":

". . . high school valedictorians tend to do well in college, but not as well (on average) as they did in high school. . . ."

One reason for this is that in college they are competing with other valedictorians. The standard is higher. The effect is pronounced in amateur athletics. I may be the greatest gymnast ever in East Overshoe, but to win an olympic gold medal I have to be the greatest gymnast anywhere. There is a limited population out at the ends of the distribution curve. This is not regression to a mean but selective filtering.

John F. Akerley
jfa@erols.com

Kruger, Savitsky and Gilovich provide an interesting and useful discussion. The article, however, is marred by a very poorly worded statement: "After four lost bets on the roulette wheel . . . the odds of improvement in the next four spins is 95 percent."

It is possible to interpret this statement as being mathematically correct, but only by expanding the described conditions to fit specific types of betting. Even then, the statement is misleading.

Max Maven
MaxMaven@aol.com

The Ten-Percent Myth

I very much enjoyed Benjamin Radford's article "The Ten-Percent Myth" in the March/April 1999 issue. Whenever the myth that we only use 10 percent of our brains

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would pop up in my introductory psychology class, I would ask the students what they thought would happen if 90 percent of their brain were removed. How well would they function with the remaining 10 percent?

Mark Hochhauser, Ph.D.
Golden Valley, Minn.

In "The Ten-Percent Myth," Benjamin Radford cites two compelling reasons why the myth should be taken as untrue: imaging studies of working brains, and non-localized brain function. But there is at least one other argument pointing in the same direction: in the course of evolution, living organisms never develop "unused" structures. This is true in particular if these structures demand a large energy supply both to be built and operated, as is the case of the human brain. Any development of such a largely "unused" structure would automatically put the organism at disadvantage in competition with other better designed organisms, and it would quickly cease to exist as a species.

Ivo Busko
Science Software Group
Space Telescope Science Institute
Baltimore, Md.

Re: "The Ten-Percent Myth":

According to the stand-up comedian Lorne Elliott, whenever anyone claims we only use 10 percent of our brains, there's a 90 percent chance they're wrong!

Matthew Cope
Westmount, Quebec
Canada

Thanks for jolting me out of accepting one of those things I've heard so many times I don't question them.

One thing kept going through my head while reading was: "What is the resolution of the brain scans and other evidence quoted?" Clearly the scans show that nearly all areas of the brain get used at one time or another, but do the scans tell us that all neurons within an area get used? What if neuron use is such that on a very fine scale, only 10 percent neuron use in an area is sufficient to light up the scan of that area?

Keep up the good work!

Gene Holmerud
Phoenix, Ariz.

Exact percentages aside, it seems to me that when people say we are only using a portion of our brain power, most are not talking about the brain's organic functioning (the actual electrochemical and other processes that occur in the different areas of the brain), but, rather, the brain's intellectual capabilities. Long-term memory has an almost unlimited capacity. How much of that capacity is utilized? As a youth I was engaged in athletics and diligently practiced the gross motor movements that my game required. As a pianist I spent hours a day honing my fine motor, as well as my interpretive, skills. As a student I have spent years studying, memorizing, understanding concepts, and attempting to find relationships between seemingly different ideas and impressions. As a moral humanist I have worked the hardest, at least emotionally, to make the "right" choices and isolate my biases and emotional needs from making a rational and moral decision. In other words, some people utilize their brains more effectively than others.

Had I instead sat at home watching Jerry Springer, drinking beer, and chewing on potato chips (excuse the stereotype), would I be the same person? Surely the efforts I have put forth to tap into my potentialities has increased my physical and intellectual capabilities, perhaps using a few more percentage points of the brain's almost limitless capacity. I have no doubt that removing a portion of my physical brain would incapacitate, to a similar degree, both my beer drinking persona, as well as my intellectual and humanist persona.

But I do not believe that is what's meant when people talk about the brain's "potential." Had I worked even harder, perhaps I would be more athletic, more knowledgeable, a better pianist, and a more humane person. That, I believe is what is meant by "using only a portion of your brain." Perhaps an unfortunate confusion or misunderstanding exists between what people mean by the actual architecture of the brain (yes, all of it is used), and its incredible capacities or functions (at least some degree is left sitting at the foot of a TV set).

Arthur Pomerantz
Silver Spring, Md.

Benjamin Radford's "The Ten-Percent Myth" is a disappointingly empty and trivial editorial item, purporting to disprove the "tired . . . old myth" that "people use only ten percent of their brains."

Apart from the inclusion of a purely notional percentage, this statement is in fact almost self-evident. I speak one language fluently but am well aware that, with application, I could manage ten or more. I am no neurologist, but I assume that each additional language would require further elaboration of the connections between my brain cells. I play a fairly mean hand at bridge or cribbage, but am well aware that there are dozens of card games I might master should I so choose. In almost every field of thought we all have such massive reserves of (cortical) potential.

Radford chooses to assume that an "unused 90 percent of the brain" must imply inactive chunks of cortex: "The myth presupposes an extreme localization of functions in the brain. If the 'used' or 'necessary' parts of the brain were scattered all around the organ, that would imply that much of the brain is in fact necessary." We need only replace "unused parts of the brain" in this argument with "unread books in a library" to show how illogical it is.

Dick Atkinson
South Shields
Tyne & Wear, U.K.

Chief Seattle's 'Speech'

I began to read with interest the article in the March/April 1999 issue by William S. Abruzzi, "The Real Chief Seattle Was Not a Spiritual Ecologist." I continued to read, piqued by the allegation that "not only were the words never spoken by Chief Seattle; they could not possibly have been." But I was ultimately quite disappointed: Mr. Abruzzi never produced the *proof* that Seattle *could not* have spoken the words commonly attributed to him.

I understand that with various re-writes, it is impossible to identify—had Seattle actually spoken something along the lines of "the speech"—the precise text of his original. But Mr. Abruzzi goes a major leap beyond the assertion of confusion. He appears to assert that the confusion is proof itself that Seattle never possessed the sentiments embodied in any of the various forms; hence the distilled claim in the article's title. . . .

I have no problem dismissing the varied forms of Seattle's speech as fabrications of recent vintage. Mr. Abruzzi offers substantial proof of the youth of many of the versions. But for the same reason, I must dismiss Mr. Abruzzi's assertion that "the words could not possibly have been spoken by Chief Seattle." Certainly Seattle said *something*; until a verbatim transcript emerges, I believe it might

be the case that Seattle *was*—contrary to the *teasing allegation in the title, reproduced on* the cover—a spiritual ecologist.

And so what if he was? I am not swayed by an argument from authority, so it doesn't matter to me whether or not Seattle was a spiritual ecologist or said something like the words attributed to him. And if he didn't and wasn't, and could return to take back his reputation from those who have twisted it—even that would not invalidate the *sentiments* expressed in any of the various forms of "the speech," and would not tarnish the eloquence of the expression. . . .

Dan Karlan
Waldwick, N.J.

That the speech attributed to Chief Seattle is at least an embellishment is pretty well known in the Pacific Northwest. Among other commentaries is an article on the subject in the *Seattle Times* from 1991.

Even Chief Seattle's name is somewhat of a non-Indian creation. He probably pronounced it consistent with a still-used alternative spelling, Sealth. It is said that settlers' difficulty with the correct pronunciation led to the spelling which was adopted (over the chief's objections, although not for orthographic reasons) as the city's name.

William Kreuter
Seattle, Wash.

I enjoyed William S. Abruzzi's article on Chief Seattle, but I *think he misinterprets* the passage concerning the buffalo slaughter (p. 46). I don't think Perry, or whoever the author was, meant that the "thousand rotting buffaloes" were all killed by a single individual. I took the phrase "the white man" to mean "white men" generally. After several readings, it still seems odd to me to construe it to mean a specific person, even though the singular is used.

The rest of Abruzzi's arguments against the authenticity of the buffalo reference are compelling, and the article as a whole is useful demythologizing. But there were enough convincing arguments against Chief Seattle's authorship that this (at the very least) debatable point should have been skipped. After all, the appearance of error in debunking lends ammunition to those who would dismiss it as cynicism.

Jason Spicer
Mukilteo, Wash.

You'd think that in researching his otherwise *fine article on Chief Seattle, William Abruzzi* would have discovered that the first territorial governor of Washington was Isaac Stevens.

Steve Ramsdell
Bremerton, Wash.

William S. Abruzzi mars his otherwise thorough and righteous exposure of the bogus "Speech by Chief Seattle" by calling the first territorial governor of Washington "Isaac Williams"; the man's name was Isaac Stevens. Also, the accepted spelling of the tribe living near Elliott Bay is Duwamish, not Duamish.

Tom Petersen
Washington State
History Teacher
Kenmore Junior
High School
Kenmore, Wash.

Could Messages Hide in DNA?

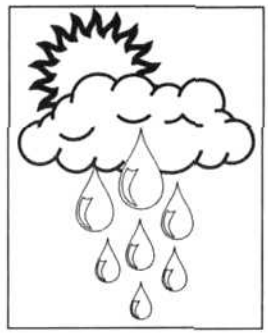
I read with interest "Hidden Messages in DNA" (March/April 1999). In *The Science of Aliens* I discuss a (fictional) scenario in which scientists discover that a large portion of the tarsier's genetic material codes for the decimal digits of π (3.1415 . . .)!

If you were an alien creature trying to code a message using the four symbols of DNA's genetic code (G, C, A, and T), how would you accomplish this, and what message would you encode? I discuss various theoretical methods for doing this in *Mazes for the Mind*, but the idea of placing messages in genetic sequences in not entirely fanciful. Joe Davis at MIT once hoped to place messages in the DNA of a bacterium that could duplicate and spread through the galaxy. His collaborator, Dana Boyd, a geneticist from Harvard, had synthesized a short sequence of DNA consisting of forty-seven base pairs with a brief coded message. When converted to a grid of binary digits, the message appeared as a sketch of part of the human body. One hundred million copies of this message have been stored in a vial. At this point Davis and his colleagues do not really plan to disperse these bacterial spores, but Davis has noted that this "may be the only practical way for humans to explore *the cosmos.*"

If I had to design a long message, it would contain an attention-getting segment not found in nature, followed by instructions on how to read the message, followed by the message itself. To ensure the long-term survival of the attention-getter, language lesson, and message, these segments would repeat many times in case some of the genetic material mutated.

Some pharmaceutical companies have suggested the use of plasmids (short pieces of extrachromosomal DNA) to carry a unique code that could be easily detected at a later date. This imprint would be a short DNA sequence coding for a tiny protein naming the originating institution.

Clifford A. Pickover
Yorktown Height, N.Y.



Joint Pain and Weather

As an avid twenty-plus year skeptical reader (by personality as well as profession) one of my pet peeves as we "scientists" attempt to debunk the myriad of New Age/religious/etc. unscientific B.S. which constantly appears in print is to allow similar tripe by "us" to appear in a reputable journal such as SKEPTICAL INQUIRER. I am referring to Donald Quick's *most uninformative piece on "Joint Pain and* Weather" (SI, March/April 1999).

His hypothesis is a worthy one. Why not examine the popularly held believe that weather influences joint pain and determine its veracity? My problem is that his article fails under its own illogic and apparent ignorance of medicine. I find it fascinating that he states "Almost all of the scientific studies of weather and joint and joint pain have failed to rule out psychological effects. In fact, it's almost impossible to do" only to summarize that "I think it's reasonable to conclude that weather-related pain is not really a *medical* [italics mine] problem because flare-ups of pain are likely to occur (for unknown reasons) regardless of the weather."

I know psychiatrists and rheumatologists *everywhere are relieved that their patients can* now stay home because psychiatric illness (depression or Quick's "difficulty in dealing with the disease psychologically") is no longer a medical problem. His comment "If weather

related joint pain isn't real, why do so many people believe in it?" betrays his bias. He decides this with conflicting studies from a literature search? This is from a director of clinical research? And, worse yet, from a rehab center? What was the point in writing this article since he proffers no new insight except his own unscientifically supported statements?

Richard Oberg, M.D.
Jackson, Tenn.

The Skepticism of Inclusion

I must commend your recent editorial on "The Skepticism of Inclusion" (March/April 1999, p.4), particularly your comment about forgoing "religious tests" in reaching out to the public. If an atheist can be permitted to say it, "Hallelujah, it's about time."

All too often skeptics and secular humanists seem bent on a monomaniacal obsession to "purge" religion from culture, and from between people's ears, that is chillingly similar in spirit to the Inquisition itself. Lest any atheist become too haughty and sanctimonious, they would do well to remember that the ranks of the religious can include (among others) persons morally and intellectually superior to themselves. Certainly religion and mysticism have at times been the authors of misery and bloodshed, but never let it slip from memory that the most prolific human abattoir of the century has been that thoroughly godless beast called Communism.

Irony or paradox that it may seem, a professed religious believer can still have as splendid a practical intellect for navigating the real world as the secular humanist, and also can be equally appalled by fraud and wooly thinking. Always a good thing to remember in the hunt for allies!

Julius Wroblewski
Vancouver, B.C.
Canada

In the Editor's Note in the March/April 1999 SI, I was amused or something to see your proposal that more women should be welcomed into the movement, and then to look at the editorial staff in the adjacent column, and find a total of three female names and four ambiguous ones out of a total of thirty-two. If you want women in the movement, here is the perfect place to start. And how about now?

Frederick Crane
Mt. Pleasant, Iowa

Two Approaches Complementary

Your review of *Unweaving the Rainbow* by Richard Dawkins (March/April 1999) perpetuates a myth all too common in skeptical circles—that the mystic's sense of wonder is "the same" as the scientist's sense of awe before the mysteries of nature.

This is pure reductionism. It denies the uniqueness of the mystic's spiritual experience as distinct from the scientist's experience. Surely you wouldn't say that a person in love with his spouse has the very same feeling as a person in love with his research about mating behavior (at least not under normal circumstances!).

Similarly, a mystic who feels awe in the presence of a loving God when contemplating nature's beauty is not having the precise experience of a scientist who feels awe when contemplating nature's magnificent complexity. Likewise, a mystic who experiences an inner "divine" light when meditating or praying in nature is not having the exact same feeling as a scientist who is mentally and emotionally elated when considering how much of the vast cosmos has been scientifically explained and tantalizing new mysteries that remain to be solved.

One way of looking at the world is not better than the other. They are two approaches which can be complementary; indeed, they can coexist in the same person. You recognized this in your Editor's Note with your observation that "scientists and skeptics include religious people as well as atheists."

This enlightened view is belied, however, by your apparent endorsement of Dawkins's claim that the scientist does something "additional" that the mystic fails to do—the scientist follows up on the impulse to "find out what we can" about nature. Such a comparison is more than silly; it is downright harmful. A religious person could well retort that the mystic does something "additional" that the scientist fails to do—like caring for the hungry and homeless as a way of expressing the divine love.

Both attitudes involve stereotypes that only feed the "I'm better than you" animosity between science and religion. Let's call a truce in the science versus religion wars that are waged all too frequently by skeptics and religious believers alike. Let's accord each the dignity and respect they deserve in their different domains.

Gloria J. Leitner
Arlington, Mass.

Evolution, Complexity, and Progress

I am astonished at Ralph Estling's virulent attack on Stephen Jay Gould and his ideas ("Straight Flush," March/April 1999).

Isn't Mr. Gould "one of us?" Moreover, I find Mr. Estling's attack to miss the point in some particulars, and to make a mountain of a molehill in others.

I read Mr. Gould's column in *Natural History* regularly for some years. The idea of a "pyramid" of evolution, purposefully striving for the point of that pyramid, was one of things he most opposed, but this is not even mentioned by Mr. Estling.

I tend to agree that some "progress" is inevitable as niches are filled and innovation (vertical change) supercedes mere horizontal changes. Otherwise, evolution is just as likely to evolve HIV as *Homo*.

It has been many years since I first learned how Beethoven purposefully exaggerated some of his tempo markings, as a goad to reluctant musicians. I take Mr. Gould's more expansive statements as a similar antidote to some of the mindless dogma of the past.

But rather than arguing about dogmas old and new, should we not be more concerned about "politically correct" textbooks that avoid teaching our youth anything solid in order to avoid conflict?

Wayne Erfling
Miramar, Fla.

"Straight Flush" by Ralph Estling misses Dr. Gould's points. Mr. Estling states that evolution includes "gradual . . . development in complexity." It all depends on how you define "complexity," I suppose. Granted, multicellular creatures are more complex than unicellular creatures, but are amphibians more "complex" than fish? Flounders undergo a physical transformation from an upright-swimming stage to a flat-lying adult condition, and some fish can transform into the opposite gender and back; is this less "complex" than an eft adding legs and becoming an adult salamander? Are mammals "more complex" than dinosaurs? Modern sharks appear in the Mesozoic; they differ from Paleozoic sharks, but are they more "complex?"

Mr. Estling writes, "progress . . . allows (organisms) to exercise increasing control over their environment." *Webster's New World Dictionary* defines progress as "1. a moving forward; 2. development; 3. improvement." This definition implies a goal. Mr. Estling

seems to assume that evolution must have an aim, the development of human beings as the final goal of the entire process. Dr. Gould's point about the workings of chance is not that the process of evolution is completely unpredictable, but that the *outcome* of that process is not predictable. Flip an honest coin, or roll an honest die, and you cannot predict the result. Watch an evolutionary process from its beginnings, and you cannot predict what creatures will develop.

Dr. Gould's conclusion, that evolutionary outcomes are unpredictable, is neither unimportant nor insignificant. Anything that damages the complacency of human beings that they are lords of the planet, able to carry out whatever destructive impulses they may have, may help to save our species. Life on Earth has survived ecological catastrophes before, albeit greatly altered. Life will endure. We may not.

Howard F. Heller, M.D.
Mountlake Terrace, Wash.

Natural selection is hard enough to understand correctly without Ralph Estling muddling it up by continuing to project archaic philosophical notions of causality into descriptions of the process. With apologies to Lewis Thomas, life on Earth most certainly has not moved from archaebacteria to the Mass in B-Minor, in 3.7 billion years or in any other time frame. As Professor Gould helps us to remember, life is not moving from anywhere to anything, except in the imaginations of human mammals.

Life moved from self-replicating molecules to a largely unknown variety of forms, then moved again from some simple life forms into a number of, again, largely unknown forms, and again, and again. At the points of mass extinctions, life can hardly be seen to be going anywhere; "forward" is defined pretty much as not disappearing. Somewhere along the line we can discern that life "moved" from simple bacteria to astonishing numbers of vertebrates; later it "moved" from some puny survivors to many forms including what we now call dinosaurs; later it "moved" from some puny survivors to insects, mammals, and whatever else is currently living. At some future point, if patterns hold, a catastrophe will change the survival rules so drastically that some unknown amount of what we see is all that survives, and it will "go" somewhere. If you're going to say that when it is diversifying, life is "progressing," then we must say that during mass extinctions life is "regressing" or "starting over." Or perhaps you can say life "moved" from a complex form to a less complex form to meet the new criteria (but that's precisely a direction that Mr. Estling says life does not go). Either way, no line drawn from bacteria to music could be considered straight, or even a sum of vectors with similar directions.

There is only human ego to buttress the idea that the Mass in B-Minor, or humans themselves, are anything like an end-point or even a point-in-transit for any of these processes. We see mammals as a point in a line only retrospectively, and only because they came through the disaster that dismantled the dinosaurs and almost everything else. If the Mass survives into the next rule set, well, that's all it's done. Our brains don't want to see it that way, which is why writers like Stephen Jay Gould are necessary, and important. . . .

Carl Gregory
Austin, Texas

Ralph Estling replies:

These letters are interesting. "Straight Flush" endorses the "establishment" view of Richard Dawkins, John Maynard Smith, George C. Williams, and almost all evolutionary biologists who have written or spoken on the subject. I had been a bit concerned that people would write in asking why I bothered to expound on so obvious and self-evident a fact that humans are somewhat more advanced a species than bacteria, and I had my rather apologetic response ready and waiting. But if people insist on there being no such thing as evolutionary progress (as I had defined it at the bottom of the second column of my article) over these last three billion years or so, my article may have been more pertinent than I thought. (By the way, I sent my article to Richard Dawkins, and he replied that he agrees with me.)

Zoological Taxonomy Not Cryptozoology

I resent Pickover's (News and Comment, March/April 1999, p. 14) treating my scientific specialty as a subfield of the fringe undiscipline cryptozoology. For centuries, we taxonomists have been discovering actually existing animals. Sometimes our discoveries are spectacular, e.g., the coelacanth, the Vu Quang "ox," the okapi, and the mountain gorilla. We're still finding about three

Jake Page

new large mammals per decade.

This century witnessed emergence of "cryptozoologists," classic pseudoscientific fringe "believers" and proselytizers exemplified by Bernard Heuvelmans, Ivan T. Sanderson, Roy Mackal, and others. They believe (or profess to) in many fantastic creatures, such as the Loch Ness monster, Bigfoot, sea serpents, and present-day dinosaurs. Some "cryptozoologists" have been demonstrable charlatans, others merely preternaturally gullible. Not a scrap of one of their creatures has ever turned up.

Every time a new animal undreamt of by cryptozoologists is discovered, cryptozoologists claim that this somehow supports their claims. But they make *specific* claims about *specific* fabulous creatures. The cryptozoologists' "logic" is as if archaeological finds demonstrating the existence of previously unknown historical figures such as King Tutankhamen and various Mayan notables could somehow support belief in the historicity of Hercules, Pandora, and Icarus.

In a ploy to have the legitimacy of actual scientific researchers rub off on them, cryptozoologists will call legitimate zoological discoverers fellow cryptozoologists. Some legitimate scientists have even been sucked into thinking of themselves as cryptozoologists. Similarly, some people with legitimate scientific credentials call themselves creationists, but this doesn't make creationism a science or any field of any science a part of creationism.

Ronald H. Pine
Illinois Mathematics and Science Academy
Aurora Ill.
and Research Associate,
Field Museum
Chicago

It's My Turn

It's My Turn is an American movie that is a notable exception to the depiction of scientists as "physically peculiar, socially incompetent, . . . and unable to initiate or maintain romantic relationships" (News and Comment, March/April 1999). Jill Clayburgh plays a young, vivacious, attractive mathematician who is involved in a romantic relationship. The movie is also notable for its realistic depiction of a mathematical problem and her attempt to solve it. Perhaps pure mathematics is less threatening than genetic manipulation. In any case, this movie is a refreshing change from the usual Hollywood fare.

Elmer M. Tory
Professor Emeritus of Mathematics
Mount Allison University
Sackville, N.B.
Canada

Fields of Confusion

Peter Graneau's letter in the March/April issue contains too many errors for me to let it slip.

First of all, Einstein's aversion to "spooky action at a distance" refers not to the action of fields (gravitational, electric, or magnetic) over distances, as Mr. Graneau seems to believe, but to the apparent ability of quantum mechanically "entangled" particles to communicate with each other instantaneously over arbitrarily large distances. Such interactions were confirmed in the early 1980s (Einstein died in 1955). Einstein was wrong, but that has nothing to do with Special Relativity or the remainder of the letter.

The Lorentz force describes the force felt by a moving charged particle in a magnetic field (if Mr. Graneau has a different definition, it might explain the confusion). With suitable mathematical adjustments, it can be made to describe the force on a wire or coil in such a field. A classic problem for undergraduates it to show how a simple induction motor works (or, conversely, how a generator works). Such a motor constitutes a very rough test of the Lorentz force: if the motor works, so too does the theory predicting that it should. Mr. Graneau is correct in claiming that metal atoms and electrons act on each other over a distance in such a motor. It is not this action which Einstein found "spooky"; indeed, he developed Special Relativity (SR) with this action specifically in mind, and SR is a wonderful explanation of the origin of the magnetic force.

I can see how a nonspecialist might be easily confused (there are two different actions-at-a-distance here) but I cannot understand how one who has published three books on the subject could have both misunderstood Einstein's intent and failed to pick up an elementary E+M textbook to learn the basics of that which he intends to critique.

Robert Lyman
Williamstown, Mass.

Defining Atheism

Reading Brian Templeton's attempt to *redefine* atheism (Letters, March/April 1999) brought to mind a Madalyn O'Hair lecture I attended about twenty years ago. After her prepared remarks she entertained questions. In the process of answering one question she unintentionally revealed that she is not an atheist, but is in fact "merely" an agnostic. Asked to define atheism, she said that after years of struggle she decided that an atheist is someone free of theism. She thought she had formulated an original and unique definition, but later discovered that someone had beaten her by about 400 years.

She attempted to get the publishers of several major dictionaries to accept her definition. She said that any person who declared there is no god (i.e., the *dictionary definition* of an atheist) is as big a fool as anyone who declares there is a god (i.e., a theist). Both positions are based on *faith*, which is the basis for all religions. In other words, atheism could be thought of as another form of religion, and this was apparently unsettling to her. It became apparent to me that to be known as "merely" an agnostic would have made her sound weak, and would not have served to get her the attention from the press that she required for her larger purpose.

I suspect Mr. Templeton may also be shy about being known as "merely" an agnostic.

Roger A. Markley
McKinney, Texas

A letter to the editor in the March/April 1999 issue titled "What Atheism Holds," makes the following statement: "Schier's false assumption is that atheism is a statement that there is no god. 'Tain't so. All atheism says is the simple and obvious fact that there is no evidence for the existence of supernatural beings. . . ."

Does the author of this letter feel free to redefine words commonly used in the English language? I looked up two definitions in my *Pocket Oxford Dictionary*. Atheism is defined as "belief that no God exists" while agnosticism is defined from the word agnostic, defined as "one who believes that nothing can be known of the existence of God or of anything but material phenomena." These are essentially the definitions I learned in high school more than thirty-five years ago.

As for the closing jibe in the article about "extraordinary evidence," most of us who believe in God also believe that the existence of God is inherently unprovable and would view any purported proof of this existence with enormous skepticism. The author's choice not to believe in God imposes no burden of proof on those who do.

Edward L. Bosworth
elboswor@ingr.com

But Tolstoy Did Write Long Books

While David Hawkins's note re Tolstoy (Letters, March/April 1999) was humorous, skeptics should check out their facts first. Ambrose Bierce was wrong on two counts: (1) Turgenenev, not Tolstoy, was a nihilist, and (2) this was not the definition of nihilist, but of a solipsist. Tolstoy was neither a nihilist nor a solipsist.

George Shenkar
Detroit, Mich.

The Panic Button?

Robert Bartholomew's "The Martian Panic Sixty Years Later" (SI, November/December 1998) is a well-thought-out piece. It makes a valuable contribution to our understanding of this well-known illustration of a mass panic. Nonetheless, I found that in a number of particulars, I thought a few interesting points remained and could still be made.

The heart of Bartholomew's article seems to focus on the question of, "Could it happen again today?" Bartholomew seems to feel that it very likely could. He cites social structural factors and specific incidents—both within the U.S. and elsewhere—to support that position. Personally, I'd like to argue here that the correct answer is that it's much

less likely to happen now in the U.S. than in the 1930s, and if it occurred at all today, it's rather more likely that it could happen in the less industrialized nations.

Bartholomew mentions that the original Welles broadcast for the Mercury Theatre took place a little "after 8 o'clock on Sunday evening, October 30, 1938." This moment in time is an astonishingly good example of what is sometimes referred to as "historical particularism"—meaning any historical event can never really occur again in exactly the same way. In part this can be asserted because the particular moment in question in U.S. history was unique in several ways. For one thing, the Charlie McCarthy and Edgar Bergan Show was by far the most popular radio program in the nation at the time. Let us then note that the current generation is not the first to invent "channel surfing." Undoubtedly, many radio listeners tuned in to the Charlie McCarthy Show initially, and only changed radio dial to the station carrying the Welles broadcast when the first commercial came on the air fifteen minutes later. The significance is, of course, that by then the new listeners to the Mercury Theatre would have missed the initial disclaimer that what was to follow was only fiction.

Bartholomew does us a favor by pointing out how fallible human perception is, and he mentions personal factors as one source, and also alludes to sociological influences. However, one social psychological aspect that receives scant attention by the author is that of the "interaction net." Panic behavior in the real world is less spontaneous and individualistic than most popular, and even scholarly accounts, would have one believe. Generally it's true that rather than individuals immediately losing control and fleeing in the face of a fear-inducing situation, what actually happens (at least where humans are in close contact either physically or even "virtually") is that individuals query each other back and forth until they collectively arrive at a definition of the situation. This then is the operation of the social interaction net. Therefore, the definition of the threat, as well as prescribed reactions, are ones which are socially negotiated. Woody Allen, for one, seems to have missed this point in his film *Radio Days*. Allen shows people instantly fleeing upon hearing the Welles broadcast—rather than "negotiating" the nature of their "panic."

Nonetheless, it is to be admitted that the broadcast was masterly in arousing symbolic fears. The attack comes largely at night. This means that people are deprived of "situational anchorages" normally provided through their physical senses. Additionally, the choice of toxic gas as a major attack agent brilliantly picked up on the anxiety of a nation that was feeling that a new world war might be imminent. After all, the most horrific effects of recently ended World War I had been associated with gas warfare. Note that in the Welles broadcast, the gas is black. That fact, of course, makes the night setting of the story all the more significant. It was in New York and its immediate environs where actual panic was most notable, and that is precisely where the Martian "gas attack" was said to take place in the broadcast. . . .

Raymond A. Eve, Ph.D.
Professor of Sociology
University of Texas
at Arlington
Arlington, Texas

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WHENCE RELIGIOUS BELIEF?

from page 54

They don't pause to wonder why a God who knows our intentions has to listen to our prayers, or how a God can both see into the future and care about how we choose to act. Compared to the mind-bending ideas of modern science, religious beliefs are notable for their lack of imagination (God is a jealous man; heaven and hell are places; souls are people who have sprouted wings). That is because religious concepts are human concepts with a few emendations that make them wondrous and a longer list of standard traits that make them sensible to our ordinary ways of knowing.

But where do people get the emendations? Even when all else has failed, why would they waste time spinning ideas and practices that are useless, even harmful? Why don't they accept that human knowledge and power have limits and conserve their thoughts for domains in which they can do some good? I have alluded to one possibility: the demand for miracles creates a market that would-be priests compete in, and they can succeed by exploiting people's dependence on experts. I let the dentist drill my teeth and the surgeon cut into my body even though I cannot possibly verify for myself the assumptions they use to justify those mutilations. That same trust would have made me submit to medical quackery a century ago and to a witch doctor's charms millennia ago. Of course, witch doctors must have *some* track record or they would lose all credibility, and they do blend their hocus-pocus with genuine practical knowledge such as herbal remedies and predictions of events (for instance, the weather) that are more accurate than chance.

And beliefs about a world of spirits do not come from nowhere. They are hypotheses intended to explain certain data that stymie our everyday theories. Edward Tylor, an early anthropologist, noted that animistic beliefs are grounded in universal experiences. When people dream, their body stays in bed but some other part of them is up and about in the world. The soul and the body also part company in the trance brought on by an illness or a hallucinogen. Even when we are awake, we see shadows and reflections in still water that seem to carry the essence of a person without having mass, volume, or continuity in time and space. And in death the body has lost some invisible force that animates it in life. One theory that brings these facts together is that the soul wanders off when we sleep, lurks in the shadows, looks back at us from the surface of a pond, and leaves the body when we die. □

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Write clearly, interestingly, and simply. Avoid unnecessary technical terms. Maintain a factual, professional, and restrained tone. Submissions are judged on the basis of interest, clarity, significance, relevance, authority, and topicality.

Direct critiques toward ideas and issues, not individuals. Be prepared to provide documentation of all factual assertions. A useful set of guidelines for those who seek to evaluate claims, titled "Proper Criticism" and written by Professor Ray Hyman, is available from the Editor. Among the guidelines: clarify your objectives, let the facts speak for themselves, be precise and careful with language, and avoid loaded words and sensationalism. State others' positions in a fair, objective, and nonemotional manner.

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BELGIUM. SKEPP, W. Betz, Secretary, Laarbeeklaan 103, B1090 Brussels (Fax: 32-2-4774301).

BRAZIL. Opcão Racional, Luis Gutman, Rua Santa Clara, 431, Bloco 5, Apt. 803, Copacabana - Rio de Janeiro 22041-010 (+55-21-547-2088 or +55-21-235-2476).

BULGARIA. Bulgarian Skeptics, Contact: Wladimir Daskalow, Krakra 22, BG-1504 Sofia, Bulgaria.

CANADA. Alberta Skeptics, Heidi Lloyd-Price, Secretary, P.O. Box 5571, Station A, Calgary, Alberta T2H 1X9. **British Columbia Skeptics,** Contact: Lee Moller, 1188 Beaufort Road, Vancouver V7G 1R7. **Ontario Skeptics,** Henry Gordon, Chairman, 343 Clark Ave West, Suite 1009, Thornhill Ontario L4J 7K5. E-mail: hgordon@idirect.com. **Sceptiques du Quebec**: Alan Bonnier, C.P. 202, Succ. Beaubien, Montreal H2G 3C9. E-mail: www.sceptiques.qc.ca.

CHINA. China Association for Science and Technology, Contact: Shen Zhenyu, Research Center, CAST, PO Box 8113, Beijing, China. **Chinese Skeptics Circle,** Contact: Wu Xianghong, Box 4-doctor, Renmin Univ. of China, Beijing 100872.

CZECH REPUBLIC. Czech Club of Skeptics, Dr. Ivan David, Vozova 5, Prague 3, 73000, The Czech Republic.

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GERMANY. Society for the Scientific Investigation of Para-Science (GWUP), Amardeo Sarma,* Convenor, Postfach 1222, D-64374 Rossdorf (Phone: +49 6154 695021, Fax: +49 6154 695022, E-mail: info@gwup.org).

HONG KONG. Hong Kong Skeptics. Contact: Brad Collins, P.O. Box 1010, Shatin Central Post Office, Shatin, NT.

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IRELAND. Irish Skeptics, Contact: Peter O'Hara, St. Joseph's Hospital, Limerick.

ISRAEL. Israel Skeptics Society, Philip Marmaros, Chairman, P.O. Box 8481, Jerusalem. (Fax: 972-2-567-0165, Web: http://www.anigrafix.com/psi).

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JAPAN. Japan Skeptics, Jun Jugaku, Contact Person, Business Center for Academic Societies Japan, 16-9 Honkomagome 5-chome, Bunkyo-Ku, Tokyo 113.

KAZAKHSTAN. Kazakhstan Commission for Investigation of Anomalous Phenomena (KCIAP), Contact: Sergey Efimov, Astrophysical Institute, Kamenskoye Plato, Alma-Ata 480068, Kazakhstan.

KOREA. Korea PseudoScience Awareness, Gun-Il Kang, Director, 187-11 Bukahyun-dong Sudaemun-ku, Seoul 120-190, Korea.

MEXICO. Mexican Association for Skeptical Research (SOMIE), Mario Mendez Acosta*, Chairman, Apartado Postal 19-546, Mexico 03900, D.F.

NETHERLANDS. Stichting Skepsis, Rob Nanninga, Secretary, Westerkade 20, 9718 AS Groningen.

NEW ZEALAND. New Zealand Skeptics, Bernard Howard, Secretary, 150 Dyer's Pass Rd., Christchurch 2, N.Z. Vickie Hyde, Chair-entity, South Pacific Information Services, Box 19-760, Christchurch 5, N.Z. Fax: +64 (03) 385-5138. E-mail: nzsm@spis.co.nz. Web: http://www.spis.co.nz/skeptics.htm.

NORWAY. Skepsis, St. Olavsgt. 27, N-0166, Oslo.

PERU. CISPSI-PERU, Contact: M.A. Paz y Mino, Director, El Corregidor 318, Lima 25 Peru.

RUSSIA. Contact: Dr. Valerii A. Kuvakin, Zdravyi Smysl (Common Sense), 119899 Russia, Moscow, Vorob'evy Gory, Moscow, State University, Philosophy Department.

SLOVAK REPUBLIC. Society for Advocacy of Critical Thinking (SACT), Igor Kapisinsky, Secretary, Dostojevského rad 13, 811 09 Bratislava, Slovak Republic.

SOUTH AFRICA. Assn. for the Rational Investigation of the Paranormal (ARIP), Marian Laserson, Secretary, P.O. Box 46212, Orange Grove, 2119 South Africa. **SOCRATES,** Contact: L.W. Retief, P.O. Box 10240, Welgedact, Bellville 7530, South Africa, E-mail: leonr@iafrica.com.

SPAIN. Alternativa Racional a las Pseudociencias (ARP). Carlos Telleria, Executive Director, Apdto. 1516, 50080 Zaragoza. **El Investigador Esceptico.** Contact: Felix Ares De Blas, Gámez/Ares/Martinez, P.O. Box 904, 20080 Donostia-San Sebastian.

SWEDEN. Vetenskap och Folkbildning (Swedish Skeptics), Sven Ove Hansson, Secretary, Box 185, 101 23 Stockholm.

TAIWAN. Tim Holmes, P.O. Box 195, Tanzu, Taiwan.

UNITED KINGDOM. Skeptical Inquirer Representative, Michael J. Hutchinson, 10 Crescent View, Loughton, Essex IG10 4PZ. **Association for Skeptical Enquiry (ASKE),** Contact: Wayne Spencer, 15 Ramsden Wood Rd., Walsden, Todmorden, Lancaster OL14 7UD, E-mail: aske@doofa.demon.co.uk. **The Skeptic** magazine, Editors, Toby Howard and Steve Donnelly, P.O. Box 475, Manchester M60 2TH. E-mail: toby@cs.man.ac.uk.

United States

ALABAMA. Alabama Skeptics, Emory Kimbrough, 3550 Watermelon Road, Apt. 28A, Northport, AL 35473 (205-759-2624).

ARIZONA. Tucson Skeptics Inc. James McGaha, Chairman, 5100 N. Sabino Foothills Dr., Tucson, AZ 85715, E-mail: JMCGAHA@PimaCC.Pima.EDU. **Phoenix Skeptics,** Michael Stackpole, Chairman, P.O. Box 60333, Phoenix, AZ 85082.

CALIFORNIA. Bay Area Skeptics, Wilma Russell, Secretary, 17722 Buti Park Court, Castro Valley, CA 94546. **Center for Inquiry–West,** 5519 Grosvenor Ave., Los Angeles, CA 90066 (Tel. 310-306-2847) **East Bay Skeptics Society,** Daniel Sabsay, President, 70 Yosemite Avenue #309, Oakland, CA 94611 (510-420-0202). **Sacramento Skeptics Society,** Terry Sandbek, 3550 Watt Ave., Suite 3, Sacramento, CA 95821 (530-668-8551), E-mail: tsandbek@MOTHER.COM. **San Diego Association for Rational Inquiry,** Contact: Bruce R. Wallace, 945 Fourth Avenue, San Diego, CA 92101 (619-233-1888, Fax: 619-696-9476).

COLORADO. Rocky Mountain Skeptics, Béla Scheiber,* President, P.O. Box 7277, Boulder, CO 80306 (Tel.: 303-449-7537, Fax: 303-447-8412, Web: bcn.boulder.co.us/community/rms).

D.C. CAPITAL AREA. National Capital Area Skeptics, c/o D.W. "Chip" Denman, 8006 Valley Street, Silver Spring, MD 20910.

FLORIDA. Tampa Bay Skeptics, Gary Posner, 1113 Normandy Trace Rd., Tampa, FL 33602 (813-221-3533), E-mail: garypos@aol.com, Web address: members.aol.com/tbayskept/tbs.html.

GEORGIA. Georgia Skeptics, Becky Long, President, 2277 Winding Woods Dr., Tucker, GA 30084.

ILLINOIS. Rational Examination Assoc. of Lincoln Land (REALL), David Bloomberg, Chairman, P.O. Box 20302, Springfield IL 62708 (217-726-5354), E-mail: chairman@reall.org.

INDIANA. Indiana Skeptics, Robert Craig, Chairperson, 5401 Hedgerow Drive, Indianapolis, IN 46226.

KENTUCKY. Kentucky Assn. of Science Educators and Skeptics (KASES), Chairman, Prof. Robert A. Baker, 3495 Castleton Way North, Lexington, KY 40502.

LOUISIANA. Baton Rouge Proponents of Rational Inquiry and Scientific Methods (BR-PRISM), Dick Schroth, Director, 425 Carriage Way, Baton Rouge, LA 70808-4828 (504-766-4747).

MICHIGAN. Great Lakes Skeptics, Contact: Lorna J. Simmons, 31710 Cowan Road, Apt. 103, Westland, MI 48185-2366 (734-525-5731). **Tri-Cities Skeptics,** Contact: Gary Barker, 3596 Butternut St., Saginaw, MI 48604 (517-799-4502), E-mail: gary@earthvision.svsu.edu.

MINNESOTA. Minnesota Skeptics, Robert W. McCoy, 549 Turnpike Rd., Golden Valley, MN 55416. **St. Kloud ESP Teaching Investigation Committee** (SKEPTIC), Jerry Mertens, Coordinator, Psychology Dept., St. Cloud State Univ., St. Cloud, MN 56301.

MISSOURI. Kansas City Committee for Skeptical Inquiry, Verle Muhrer, Chairman, United Labor Building, 6301 Rockhill Road, Suite 412, Kansas City, MO 64131. **Gateway Skeptics,** Chairperson, Steve Best, 6943 Amherst Ave., University City, MO 63130.

NEW ENGLAND. New England Skeptical Society (NESS), Contact: Steve Novella, MD, PO Box 185526, Hamden, CT 06518, E-mail: ctskeptic@compuserve.com. **Connecticut Chapter,** Contact: Jon Blumenfeld, E-mail: jon@jblumenfeld.com. **Massachusetts Chapter,** Contact: Sheila Gibson (a/k/a "chairchick"), P.O. Box 2537, Acton, MA 01720, E-mail: skepchik@hotmail.com. **New Hampshire Chapter,** Contact: J.J. Kane, 89 Glengarry Drive, Stratham, NH 03885 Tel: 603-778-6873.

NEW MEXICO. New Mexicans for Science and Reason, David E. Thomas, President, PO Box 1017, Peralta, NM 87042, E-mail: det@rt66.com. John Geohegan, Vice President, 450 Montclaire SE, Albuquerque, NM 87108.

NEW YORK. Center for Inquiry–International, PO Box 703, Amherst, NY 14226. (Tel. 716-636-1425) **Inquiring Skeptics of Upper New York** (ISUNY), Contact: D. Sager, PO Box 603, Altamont, NY 12009. (518-861-6383). **New York Area Skeptics** (NYASk), Contact: Jeff Corey, 18 Woodland St., Huntington, NY 11743, e-mail: jcorey@liu.edu. **Western New York Skeptics,** Tim Madigan, Chairman, 3965 Rensch Road., Buffalo, NY 14228.

NORTH CAROLINA. Triad Area Skeptics Club, Contact: Eric Carlson, Physics Department, Wake Forest University, Winston-Salem, NC 27109. E-mail: ecarlson@wfu.edu. Tel: 336-758-4994. Web: http://www.wfu.edu/~ecarlson/tasc.

OHIO. South Shore Skeptics, Page Stephens, P.O. Box 5083, Cleveland, OH 44101 (216-676-4859). E-mail: hpst@earthlink.net. **Association for Rational Thinking** (Cincinnati area), Joseph F. Gastright, Contact, 111 Wallace Ave., Covington, KY 41014 (606-581-7315). **Central Ohioans for Rational Inquiry** (CORI), Michael S. Lehv, President, 78 Park Drive, Columbus, OH 43209 (Fax: 614-258-1954).

OREGON. Oregonians for Rationality, Josh Reese, Pres./Sec., 7555 Spring Valley Rd NW, Salem, OR 97304 (503-364-6255), E-mail: joshr@ncn.com, Web: http://www.teleport.com/~or4think.

PENNSYLVANIA. Paranormal Investigating Committee of Pittsburgh (PICP), Richard Busch, Chairman, 8209 Thompson Run Rd., Pittsburgh, PA 15237 (412-366-1000), E-mail: mindful@telerama.com. **Philadelphia Association for Critical Thinking** (PhACT), Bob Glickman, President, PO Box 21970 Philadelphia, PA 19124 (215-533-4677), Web: http://www.voicenet.com/~eric/phact.

TENNESSEE. Reality Fellowship, Contact: Carl Ledendecker, 2123 Stonybrook Rd., Louisville, TN 37777.

TEXAS. Houston Association for Scientific Thinking (HAST), Darrell Kachilla, P.O. Box 541314, Houston, TX 77254. **North Texas Skeptics,** Joe Voelkering, President, P.O. Box 111794, Carrollton, TX 75011-1794.

WASHINGTON. The Society for Sensible Explanations, P.O. Box 45792, Seattle, WA 98145-0792. Tad Cook, Secretary. E-mail: tad@ssc.com.

WISCONSIN. Contact: Mike Neumann, 1835 N. 57th Street, Milwaukee, WI 53208 (414-453-7425, E-mail: mike@omnifest.uwm.edu).

*Member, CSICOP Executive Council
°Associate Member, CSICOP Executive Council

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SCIENTIFIC AND TECHNICAL CONSULTANTS

George Agogino, Dept. of Anthropology, Eastern New Mexico University

Bill G. Aldridge, executive director, National Science Teachers Assoc.

Gary Bauslaugh, educational consultant, Center for Curriculum, Transfer and Technology, Victoria, B.C., Canada

Richard E. Berendzen, astronomer, Washington, D.C.

Martin Bridgstock, lecturer, School of Science, Griffith University, Brisbane, Australia

Richard Busch, magician, Pittsburgh, Pa.

Shawn Carlson, physicist, San Diego, Calif.

Charles J. Cazeau, geologist, Deary, Idaho

Roger B. Culver, professor of astronomy, Colorado State Univ.

Felix Ares de Blas, professor of computer science, University of Basque, San Sebastian, Spain

Michael R. Dennett, writer, investigator, Federal Way, Washington

Sid Deutsch, consultant, Sarasota, Fla.

J. Dommanget, astronomer, Royale Observatory, Brussels, Belgium

Nahum J. Duker, assistant professor of pathology, Temple University

Barbara Eisenstadt, psychologist, educator, clinician, East Greenbush, N.Y.

John F. Fischer, forensic analyst, Orlando, Fla.

Robert E. Funk, anthropologist, New York State Museum & Science Service

Eileen Gambrill, professor of social welfare, University of California at Berkeley

Sylvio Garattini, director, Mario Negri Pharmacology Institute, Milan, Italy

Laurie Godfrey, anthropologist, University of Massachusetts

Gerald Goldin, mathematician, Rutgers University, New Jersey

Donald Goldsmith, astronomer; president, Interstellar Media

Clyde F. Herreid, professor of biology, SUNY, Buffalo

Terence M. Hines, professor of psychology, Pace University, Pleasantville, N.Y.

Michael Hutchinson, author; SKEPTICAL INQUIRER representative, Europe

Philip A. Ianna, assoc. professor of astronomy, Univ. of Virginia

William Jarvis, professor of health promotion and public health, Loma Linda University, School of Public Health

I. W. Kelly, professor of psychology, University of Saskatchewan

Richard H. Lange, M.D., Mohawk Valley Physician Health Plan, Schenectady, N.Y.

Gerald A. Larue, professor of biblical history and archaeology, University of So. California.

Bernard J. Leikind, staff scientist, GA Technologies Inc., San Diego

William M. London, consumer advocate, Fort Lee, New Jersey

Thomas R. McDonough, lecturer in engineering, Caltech, and SETI Coordinator of the Planetary Society

James E. McGaha, Major, USAF; pilot

Joel A. Moskowitz, director of medical psychiatry, Calabasas Mental Health Services, Los Angeles.

Jan Willem Nienhuys, mathematician, Univ. of Eindhoven, the Netherlands

John W. Patterson, professor of materials science and engineering, Iowa State University

Steven Pinker, professor and director of the Center for Cognitive Neuroscience, MIT

James Pomerantz, Provost, and professor of cognitive and linguistic sciences, Brown Univ.

Gary P. Posner, M.D., Tampa, Fla.

Daisie Radner, professor of philosophy, SUNY, Buffalo

Michael Radner, professor of philosophy, McMaster University, Hamilton, Ontario, Canada

Robert H. Romer, professor of physics, Amherst College

Milton A. Rothman, physicist, Philadelphia, Pa.

Karl Sabbagh, journalist, Richmond, Surrey, England

Robert J. Samp, assistant professor of education and medicine, University of Wisconsin-Madison

Amardeo Sarma,* project supervisor, EURESCOM; executive director, GWUP, Germany

Steven D. Schafersman, asst. professor of geology, Miami Univ., Ohio

Béla Scheiber,* systems analyst, Boulder, Colo.

Chris Scott, statistician, London, England

Stuart D. Scott, Jr., associate professor of anthropology, SUNY, Buffalo

Erwin M. Segal, professor of psychology, SUNY, Buffalo

Carla Selby, anthropologist/archaeologist

Steven N. Shore, associate professor and chair, Dept. of Physics and Astronomy, Indiana Univ. South Bend

Barry Singer, psychologist, Eugene, Oregon

Waclaw Szybalski, professor, McArdle Laboratory, University of Wisconsin-Madison

Ernest H. Taves, psychoanalyst, Cambridge, Massachusetts

David E. Thomas, physicist, mathematician, Peralta, New Mexico

Sarah G. Thomason, professor of linguistics, University of Pittsburgh

Neil deGrasse Tyson, astrophysicist, Princeton University and the Hayden Planetarium

Richard Wiseman, Senior Research Fellow in psychology, University of Hertfordshire

CSICOP Subcommittees

Astrology Subcommittee: Chairman, I. W. Kelly, Dept. of Educational Psychology, 28 Campus Drive, Saskatoon, Sask., Canada. 57N-OX1

Council for Media Integrity: Network Director, Barry Karr, CSICOP, P.O. Box 703, Amherst, NY 14226-0703.

Health Claims Subcommittee: Co-chairmen, William Jarvis, Professor of Health Promotion and Education, School of Public Health, Loma Linda University, Loma Linda, CA 93350, and Stephen Barrett, M.D., P.O. Box 1747, Allentown, PA 18105.

Parapsychology Subcommittee: Chairman, Ray Hyman,* Psychology Dept., Univ. of Oregon, Eugene, OR 97402.

UFO Subcommittee: Chairman, Philip J. Klass,* 404 "N" Street S.W., Washington, D.C. 20024.

*Member, CSICOP Executive Council
°Associate Member, CSICOP Executive Council

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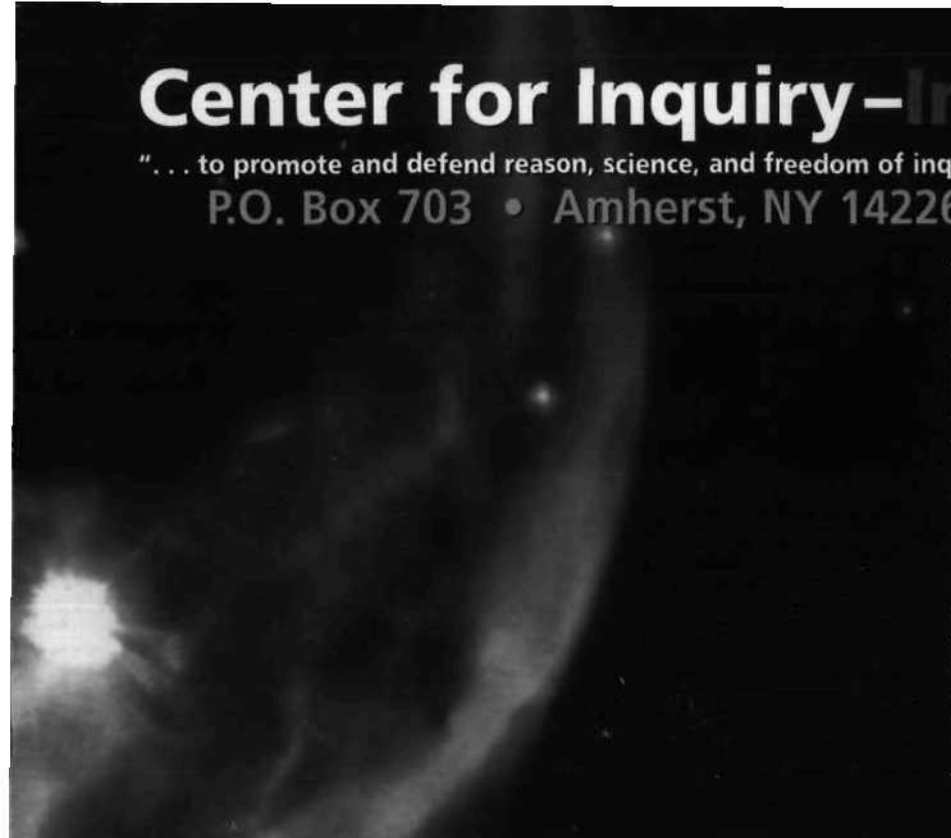

This NASA Hubble Space Telescope image reveals an expanding shell of glowing gas surrounding a hot, massive star in our Milky Way Galaxy. This shell is being shaped by strong stellar winds of material and radiation produced by the bright star at the left, which is ten to twenty times more massive than our Sun. These fierce winds are sculpting the surrounding material—composed of gas and dust—into the curve-shaped bubble. Astronomers have dubbed it the Bubble Nebula (NGC 7635). The nebula is ten light-years across, more than twice the distance from Earth to the nearest star. Only part of the bubble is visible in this image. The glowing gas in the lower right-hand corner is a dense region of material that is getting blasted by radiation from the Bubble Nebula's massive star. The radiation is eating into the gas, creating finger-like features. This interaction also heats up the gas, causing it to glow.

THE COMMITTEE FOR THE SCIENTIFIC INVESTIGATION OF CLAIMS OF THE PARANORMAL

The Committee for the Scientific Investigation of Claims of the Paranormal encourages the critical investigation of paranormal and fringe-science claims from a responsible, scientific point of view and disseminates factual information about the results of such inquiries to the scientific community, the media, and the public. It also promotes science and scientific inquiry, critical thinking, science education, and the use of reason in examining important issues. To carry out these objectives the Committee:

- Sponsors publications
- Conducts public outreach efforts
- Maintains an international network of people and groups interested in critically examining paranormal, fringe-science, and other claims, and in contributing to consumer education
- Encourages research by objective and impartial inquiry in areas where it is needed
- Convenes conferences and meetings
- Conducts educational programs at all age levels
- Does not reject claims on a priori grounds, antecedent to inquiry, but examines them objectively and carefully

The Committee is a nonprofit scientific and educational organization.
The SKEPTICAL INQUIRER is its official journal.

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Center for Inquiry–Rockies
P.O. Box 2019
Boulder, CO 80306
Tel.: (303) 449-7537

Center for Inquiry–Midwest
United Labor Building
6301 Rockhill Rd., Suite 412
Kansas City, MO 64131
Tel.: (816) 822-9840

Center for Inquiry–West
5519 Grosvenor Ave.
Los Angeles, CA 90066
Tel.: (310) 306-2847
Fax: (310) 821-2610

Center for Inquiry–Moscow
Professor Valerii A. Kuvakin
117421 Russia
Moscow, Novatorov 18-2-2